COAL AGE

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The Best Time

By Berton Braley

Written expressly for Coal Age

I

I'll tell yuh somethin', neighbor,
Which same I will expound
—Uv all the hours uv labor
I puts in underground,
The one that's most appealin'
(An' that's no idle hunch)
Comes with that hungry feelin'
When it is time fer lunch!

II

My ratchet drill—I chucks it
An' lays my shovel by,
An' opens up my bucket
An' eats my bread an' pie,
There's fun an' talk an' jokin'
Among the dusty bunch
That's eatin', laughin', smokin',
When it is time fer lunch.

III

The mule he champs his bridle,
The trapper gulps his scoff,
The bloomin' mine is idle
An' everybody's off,
The pipe smoke's curlin' hazy,
You hear the miners munch
—Gee, life is good an' lazy
When it is time fer lunch!

IV

There ain't no need to hurry,
There ain't no need to sweat,
Yuh murmurs, "I should worry,"
An "wot's the use to fret,"
Yer eyes they halfway closes,
Yuh nods among the bunch,
An' then—an' then yuh dozes
When it is time fer lunch.

V

An' so I'm sayin', neighbor,
Which same I will attest,
Uv all the hours of labor
The lunchin' hour's the best,
At minin' I'm no slow one
But—listen to my hunch,
I make my biggest showin'
When it is time fer lunch!

Flood Protection at the Illinois Mines

SPECIAL CORRESPONDENCE

SYNOPSIS—A brief description of the methods employed in protecting the shafts of the O'Gara Coal Co. during the recent floods. One of the chief troubles encountered was in obtaining clay for filling in the bulwarks; as the surrounding country was completely inundated, this material had to be carried in by hand. The water stage exceeded the previous high record of 1884 by 3 ft. but the O'Gara Co. was uniformly successful in protecting its mines.

The rich coal field of Saline County, Ill., lies in the low valley of the Saline River, a tributary of the Ohio, with its mouth near Shawneetown, Ill. The Middle Fork of the Saline River flows within two miles of Harrisburg, the county seat of Saline County. The drainage area at this point approximates 200 square miles of low land of which 25 square miles are subject to overflow. At the time of the recent flood, back water from the

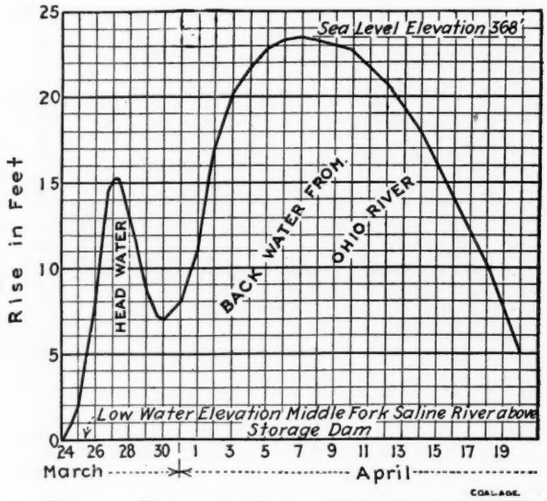


FIG. 1. PROFILE SHOWING RISE AND FALL OF THE FLOOD

Ohio River extended 30 miles inland with a varying width of from 2 to 10 miles.

No definite record of the precipitation was kept at Harrisburg during the storm period of Mar. 22 to 26, but approximately 6 in. of rain fell. The effect was plainly visible in the rapid rise of all streams, which reached a flood stage filling all the low lands on Mar. 27. On Apr. 1 the head water had almost disappeared. At 1 p.m. on this date a reversal of the current in the Saline River was noted and a rapid rise of back water at the rate of 3 in. per hr. was registered. Reports of flood conditions in other states had been received, but owing to the rapid fall of the local headwater no one feared extensive damage from the incoming flood. The overflow from the Ohio continued until Apr. 8, when observations showed the water to be stationary. The previous high-water mark of 1884 was passed and a new record 3 ft. higher has been duly recorded. A large territory in Harrisburg Township was submerged, including a portion of the city of Harrisburg. Fig. 1 shows the rise and fall of the water, while Fig. 2 shows the submerged area.

Five mines of the O'Gara Coal Co. were within the flooded district. These have a daily output of 10,400 tons of coal when operated to capacity. The shafts are all sunk in low ground but were considered above high water. Mines Nos. 2, 3, 4 and 9 are all connected, forming a chain of underground workings more than three miles in length. The average depth is 230 ft. The soil depth in the shafts ranges near 40 ft., which includes 10 to 15 ft. of loose rock fill around the timber casing.

After observing the rapidity of the rise of the water on Apr. 2, the management of the O'Gara Coal Co. began the fight to keep the water from the threatened mines. Work continued for five days and nights before the mines were considered safe; subsequently all company men reported at the mines as a reserve until the water subsided.

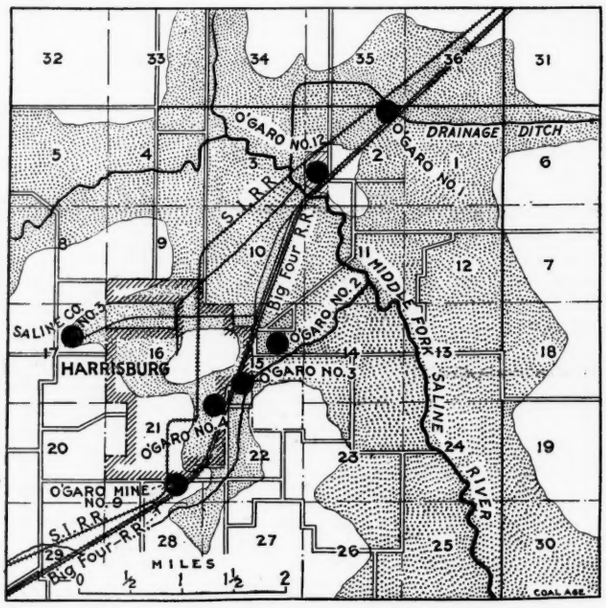


FIG. 2. MAP SHOWING AREA INUNDATED

METHODS OF PROTECTION

Mine No. 1—The air shaft and fan house at this mine are located 300 ft. distant from the hoisting shaft; they were threatened on Apr. 4. A protecting wall of puddled clay was immediately started around the entire fan house. The clay was held in place by a substantial form built of car lumber. In order to make the wall as water-tight as possible, the top soil was removed and a stiff clay substituted. This wall proved effectual against a head of 2 ft. of water. The hoisting shaft was never reached by the flood, although the same protection was provided as at the air shaft.

Mine No. 2—The hoisting shaft at Mine No. 2 was first surrounded by a wall 6 ft. distant from the casing, 3 ft. high and 2 ft. thick, formed of puddled clay supported by timber forms. As the water approached the bulkhead, leaks from underneath became so numerous that it was found necessary to increase the height of the shaft casing at least five feet. This was done and a wall formed of clay was thrown around the added casing, the clay being protected from the waves by lumber forms

well braced (see Fig. 3). The air and escapement shaft was provided with a clay and timber bulkhead carried to a height of 5 ft.

At all of the mines the greatest problem was to obtain the clay, as the territory surrounding the mines had become flooded before the work of protection began. Dump wagons drawn by company mules were abandoned after the first day's work. Railway flat cars were then loaded along the right-of-way of the Big Four Railroad two miles from the mine and placed at the mines by switch engines as long as these were able to run. Later cars were pulled in to the low mine tracks by means of block and tackle, the power being furnished by mules working from small elevated areas.

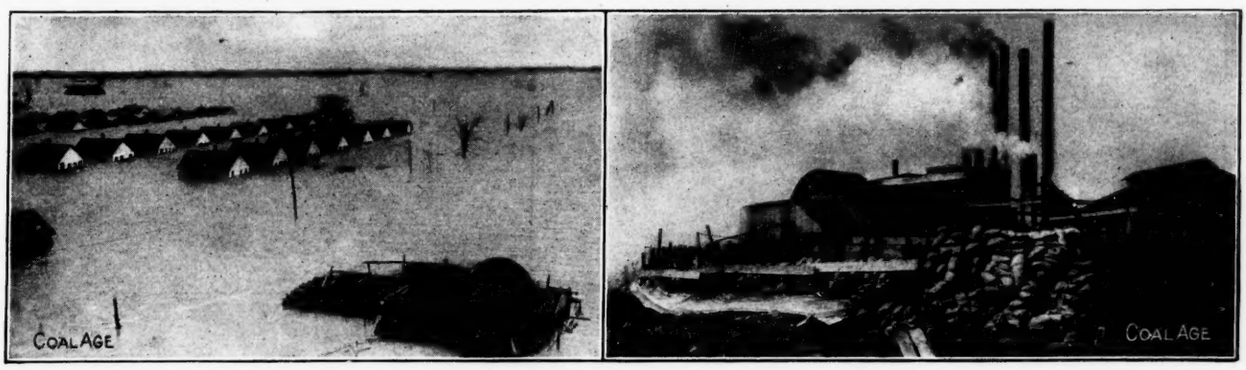
FIG. 3. HOISTING SHAFT AT THE O'GARA CO.'S NO. 3 MINE

Mine No. 3—O'Gara Mine No. 3 is located within the corporate limits of Harrisburg. The underground works are connected with O'Gara Mines Nos. 2, 4 and 9, so that the failure to save any one would have flooded all four mines. The air and escapement shaft at Mine No. 3 received the first attention. The wood casing around the shaft appeared to be weakening under the pressure of the saturated soil. Immediately men were placed in the shaft and the portion subject to the direct soil pressure was heavily reinforced.

Bulkheads made of puddled clay, supported by forms, were started around the entire fan house. As soon as the water reached these walls, leaks through the loose rock fill under the bulkheads developed to such an extent as to prove dangerous. All efforts to stop these from the outside were in vain until clay was filled in between the bulkheads and the fan house and its height kept above that of the surrounding water. When observations showed the flood at a standstill, five feet of water was found around the protecting wall as shown in Fig. 4.

More than 300 cu.yd. of clay had been used in the protection of this shaft alone, 75 per cent. of which had been carried to place in cement sacks over a trestle manway 200 ft. long. The work at night was aided by means of strings of incandescent lights, the current being supplied from the central power station at Mine No. 3. In order to do this, two boilers were surrounded by dikes and fired when the water level stood several inches above the top of the fire box. Hand pumps and jets took care of all leakage.

At the time everything seemed safe a strong wind sprang up from the east, causing waves to run 3 ft. high.



FIGS. 4 AND 5. VIEWS AT THE O'GARA CO.'S NO. 3 MINE, SHOWING PROTECTION AT AIR SHAFT

FIGS. 6 AND 7. METHOD OF PROTECTING THE AIR SHAFT AT O'GARA MINE NO. 4

These waves soon softened the clay in the bulkhead to such an extent as to render it almost fluid. Cement sacks were immediattely filled with sand, some being rammed into the softened clay while others were placed outside the walls until the exposed side was protected, as shown in Fig. 5.

The hoisting shaft at Mine No. 3 is 6 ft. higher than the air shaft and therefore requires less attention. The clay wall was thrown around it and all leaks in the casing calked. No difficulties developed at this point.

Mine No. 4—The hoisting shaft at Mine No. 4 was quite high, compared with the air shaft which required immediate attention. Owing to a peculiar location of the air shaft, it was uncertain just how soon the water would break across the railway embankment which had temporarily held it. For this reason the fan house was partially removed and the shaft sealed. (See Fig. 6.) The

FIG. 8. FLOOD AT THE O'GARA CO.'S WAREHOUSE

bulkheads with the filling of clay were also added, 200 cu.yd. of clay being used. This clay was hauled to a convenient point on flat cars, sacked and carried to place over a trestled manway, as at Mine No. 3.

RESULTS OF THE FLOOD

Some water seeped in around the casing at all the shafts. This could have been easily handled by the bottom pumps had the boilers remained in service. Two days' pumping prepared each mine for hoisting coal. The O'Gara Coal Co. sustained considerable loss, additional to the expense incidental to the actual protection of the mines. Seventy-five company houses were submerged and damaged by waves and floating débris. The company warehouse, machine shop, electric shop, foundry and corn crib were all damaged, including various supplies and machinery located at this center of distribution. Two weeks of running time were also lost, due to the railroads being unable to handle the traffic.

The work of protection was directly in charge of Harry Thomas, general superintendent of mines of the O'Gara Coal Company.

All predictions of past years that coal could not be worked at a greater depth than 1500 ft. no longer hold water. At the present day, according to W. E. Garforth, president of the British Institute of Mining Engineers, coal is being mined at depths exceeding 3000 ft. The adoption of a system of long-wall working has solved the question of superincumbent weight. The coal is exposed to this weight for a very short time and places are closed up rapidly.

A New Safety Lamp and a Blasting Machine

Schaffler & Co., of Vienna, Austria, are the manufacturers, and Peter A. Frass & Co., Inc., of 417 Canal St., New York City, are the American agents of the new mining apparatus illustrated herewith. Fig. 1 shows an electric blasting machine with a capacity of six detonators fired simultaneously. It is not a magneto but a miniature dynamo-electric generator, operated through a ratchet by a detachable T-handle.

This device measures 3⅞ in. long, 3⅛ in. wide over the strap buttons—being but 2¼ in. wide over the case—and 5¼ in. high to top of handle connection. The weight is 4½ lb. As may readily be seen, the whole machine

FIG. 1. SHOTFIRING MACHINE

is small, compact and durable, being thoroughly protected by a seamless drawn-metal case.

The magneto machines, as ordinarily constructed, are heavy for their capacity, and the magnets are certain to deteriorate or lose their strength, correspondingly weakening the current generated. This device is free from this inherent defect, as it is furnished with electro instead of permanent magnets. This greatly increases the life of the machine.

Fig. 2 shows an electric safety lamp of remarkable simplicity. The three principle exterior parts, base, housing and cover, are each a single casting of magnalium metal, which has the strength of cast brass and about the same weight as aluminum.

The battery is of the lead-plate, non-spilling, celluloid-incased type. A lug placed upon the side of the case fits into a mortise in the housing and renders it impossible to get the connections to the lamp reversed. The one- or two-candlepower tungsten filament light bulb (this lamp is made in both powers) is incased between two convex reflectors in a heavy glass cylinder, which is rendered air-tight by means of a gasket upon either end. The outer or protecting glass is shielded from external injury by four heavy columns cast integral with the main body of the housing.

The cover to which the suspension hook is attached is screwed into place and automatically locked by the insertion of the battery. A small thumb-screw upon the side

of the housing and plainly visible in the illustration serves as a switch for turning the current on or off from the lamp.

The bottom or base of the housing screws to place and is locked securely by means of a small winged socket-wrench. The locking bolt can not be readily withdrawn by any other means than this key.

As may be seen from Fig. 2, this lamp is extremely

FIG. 2. LAMP ASSEMBLED AND TAKEN DOWN

simple yet carefully made and amply strong. It weighs, dry, 4 lb. 3 oz. The addition of the electrolite would probably increase this weight a few ounces more.

An Indiana Mining Bill

The following bill introduced by Senator Kolsem, president of the Indiana Bituminous Coal Operator's Association, was passed by the last legislature, and signed by Gov. Ralston. It is felt that this law, in time will prove to be of great benefit to both the mine employee and employer.

A bill for an act to amend Section 3 of an act entitled "An act to revise the laws in relation to coal mines and subjects relating thereto, and providing for the health and safety of persons employed therein," approved Feb. 28, 1905.

Section 1. Be it enacted by the General Assembly of the State of Indiana that Section 3 of the above entitled act be amended to read as follows:

Section 3. It shall be unlawful for any operator to allow more than ten (10) persons to work in any mine at any one time after five thousand (5000) square yards have been excavated until a second outlet shall have been made; provided, that all air and escape shafts sunk hereafter shall be separated from the hoisting shaft by at least two hundred (200) feet of natural strata and shall be provided with stairways not less than two (2) feet in width, at an angle of not more than fifty (50) degrees, with landings at easy and convenient distances and with guard rails attached to each set of stairs from the top to the bottom of the same, and shall be available at all times to all employees engaged in such mines.

Also provided, that the stairways, landings and guard rails shall be of suitable design and strength to accomplish the purpose for which they are intended, and shall be kept free from obstructions. And that when the escape and air shafts are combined, the escape shaft and air shaft shall be separated by a good substantial partition from top to bottom.

Provided, further, where the approach or aproaches to the escape shaft crosses an air course, entry or other passageway used as an air course, either as an intake or return, the air current shall be conducted by an overcast or undercast, over or under the point where such approaches shall be kept free from falling slate, mine tracks, mine cars and other débris, and shall be used only as a means of ingress or egress to or from the escape shaft. All water coming from the surface or out of any strata in such shaft shall be conducted by rings or otherwise to prevent it from falling down the shaft and wetting persons who are descending or ascending the shaft. The operator may provide at such outlet or escape shaft hoisting apparatus, which shall be at all times available to all persons in the mine, the same signals to be used as provided by law for use at hoisting shafts. The traveling roads or gangways to said outlet shall be separated from the hoisting shaft by at least two hundred (200) feet of natural strata and not less than four (4) feet in height and four (4) feet wide and shall be kept as free from water as the average haulage roads in such mines. At all points where the passageway to the escapement shaft, or other place of exit, is intersected by other roadways or entries conspicuous boards shall be placed indicating the direction it is necessary to take in order to reach such place of exit. It shall be unlawful to erect any inflammable structure or building or powder magazine on the surface so near to the escapeway as to jeopardize the safety of the workmen in case of fire. And no boiler house shall be erected nearer than thirty-five (35) feet of the mine opening. All explosive materials shall be stored in fireproof buildings on the surface located not less than three hundred (300) feet from any other building.

Fans shall be located and maintained at such place as not to be directly over the opening of an air shaft or escapement shaft, and all fans hereafter installed shall be arranged so as to enable the operator, when desirable, to reverse the air current.

Provided, further, that escape shafts already constructed under the provisions of the law herein amended shall not be affected by this act except they shall be maintained according to the provisions herein.

New Development Work in Illinois

The Consolidated Coal Co., of St. Louis, with offices in the Syndicate Trust Building, have completed arrangements for the greatest development made in the coal mining fields of Illinois for many years. A huge central power house is being erected, about a mile and a half north of Staunton, which will supply all the power required at four new mines that this company will open. Mines Nos. 14 and 15 will be midway between Benld and Staunton to the west, and connected up by spurs from the C. & N. W., which is now building down to connect with either the Wabash or Litchfield & Madison. Mines Nos. 16 and 17 are two and four miles respectively southwest of Staunton on a proposed spur from the C. & N. W. The four mines will have a daily capacity of from 4000 to 6000 tons each.

No information is available as to what this tonnage is intended for, but it is presumably a part of the original Gould scheme to furnish fuel from central Illinois for all of the Gould lines, including the Wabash, Cotton Belt, Iron Mountain, and Missouri Pacific, and possibly a portion of the Texas & Pacific and International & Great Northern. Excluding the T. & P. and I. & G. N., the Gould roads at the present time are estimated to use about 40,000 tons of coal per day.

At the present time the Consolidated Coal Co. has several mines in the field east of St. Louis and has recently taken over a big operation at Johnson City in Williamson County. They, with the Western Coal & Mining Co., which has a mine in Williamson County and several mines in Missouri, Kansas and Arkansas, are furnishing fuel for part of the Gould system at this time.

The Origin and Deposition of Coal

By W. B. Richards*

SYNOPSIS—A rather detailed summary of the modern theories of the formation of coal. Types of coal measure flora are described together with the different agencies which determined the varying qualities of the fuels. Particular attention is devoted to anthracite coal.

Plants are the source of coal beds. Their stems, leaves and tissues have gathered in places and beds like peat bogs and after long burial have been converted into coal. The formation of the coal from the beds of vegetable *debris* probably only made a beginning while these lay as open beds of peat. The same process is carried forward in the modern peat beds but result only in poor coal, which contains 25 per cent. or more of oxygen. Peat is a woody material passing part way to coal and sometimes wholly so in places; it is an accumulation of half decomposed vegetable matter in wet or swampy depressions.

In the temperate climate it is due to the growth mainly of spongy masses of the genera of sphagnum which are very absorbent of water. Besides spreading over many swampy places they extend in a floating layer from the borders of shallow ponds, dropping portions to the bottom from their lower roots, as they die above. They thus gradually take possession of the pond and may form beds of great thickness. The leaves, stems, branches of trees and shrubs, growing over the marshy region or in shallow water also contribute to the accumulating bed. This dead and wet vegetable mass slowly undergoes a change in its lower part, becoming brownish-black, loose in texture and often friable, although commonly penetrated with rootlets. This change is sometimes continued until coal is formed, but unlike good coal, it still contains 25 to 33 per cent. of oxygen.†

The rate of growth varies with the amount of vegetation, moisture and other conditions. A foot of depth may form in from five to ten years. Over many parts of New England, there are extensive beds; the amount in Massachussets has been estimated to exceed 130,000,000 cords. Peat waters have an antiseptic power and, consequently, tend to prevent complete decay of the vegetable matter. The deposits of clay or sand over the peat accumulations of the Carboniferous prevented the atmospheric oxygen from participating in the change and to this is due the better product.

The Carboniferous period, or that of the coal measures, was a period of large marshes. The clay beneath the coal, often called the underclay, generally contains fossil plants and especially the roots of underwater stems of the Lepidodendrons and Sigillaria, called Stigmaria. It is often the old dirt beds of earth over which the earth's plants grow that commence to form the coal beds. It was either those or the clayey bottoms of the plant bearing marshes or basins which accounts for the slate bottom in the anthracite seams.

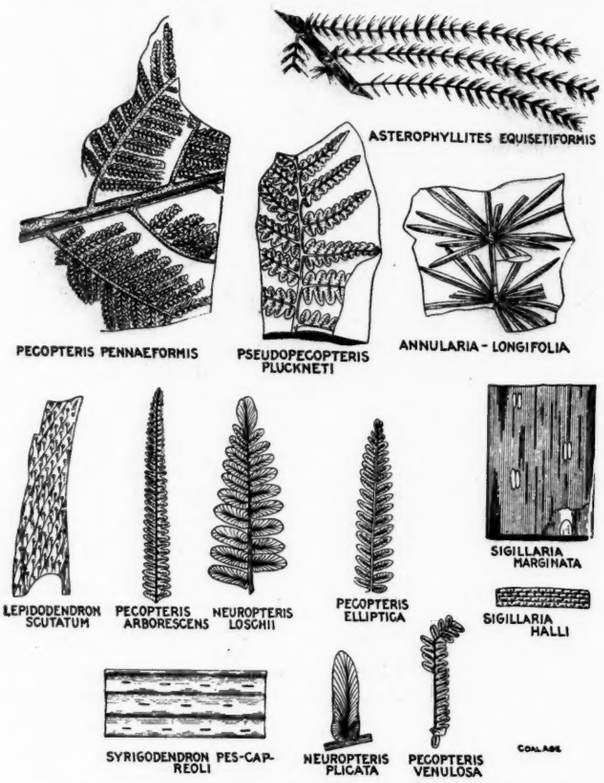
*Engineer, Lehigh Coal & Navigation Co., Lansford, Penn.

Note—Abstract of paper read before the Panther Valley Mining Institute.

†A more technical and detailed discussion of this interesting phenomenon will be found in "Coal Age," Vol. 1, page 712. —Editor.

Plant Life of the Carboniferous Period

The Nova Scotia coal fields abound in erect stumps of trees, standing in the old dirt beds. The rocks capping the coal may be slate, sandstone or conglomerate, depending on whatever circumstances succeeded. The shaly beds often contain the ancient ferns spread out between the layers and so abundant that however thin the shale may be split, it opens to view new impressions of plants. In the sandstone, broken trunks of trees sometimes lay scattered through the beds. Some of the logs of the Ohio coal measures are 50 to 60 ft. long and 3 ft. in diameter.



Typical Coal-Measure Fossils Found in the Panther Creek Valley

At Carbondale, Penn., there was found an impression of the bark of a Lepidodendron 2 ft. wide and 75 ft. long.

At Breckenbridge, Ky., the coal is marked through its whole mass by stems and leaves of the Stigmaria and Lepidodendrons, rendered distinct by the infiltration of sulphuret of iron. The coal is often penetrated with the tissues and spores of plants; even the solid anthracite has been found to contain vegetable tissues.

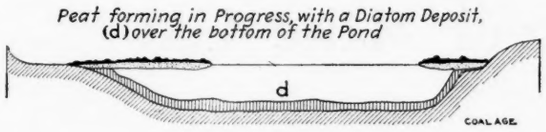
Animal material has also contributed to the coal, though sparingly, for animal decomposition always yields carbonaceous material and animal life, particularly fishes, were so abundant that the contribution in some cases may have been important. The mineral charcoal differs very little in composition from the ordinary bituminous coal. It must be kept in mind that all the agencies which contributed to the formation of coal beds worked on a prodigiously larger scale than those which are now in activ-

ity for the formation of peat. Then the deposits of vegetable remains were from an exceptionally exuberant vegetation, favored by the greatest possible humidity of the air and a superabundance of carbonic acid in the atmosphere. During that period the amount of carbon in the atmosphere was at least 3 in 1000 parts as compared with 3 in 10,000 parts today.

Deposition of the Coal Materials

The flora consisted of acrogenous plants, ferns, lycopods and equiseta (horsetail) covering nearly the whole area of the coal region. All the plants of these orders, represented by the numerous genera, were then large trees, their trunks measuring from 1 to 3 ft. in diameter and from 40 to 100 ft. high or even more, growing close together and forming an impenetrable forest of stems, branches and leaves, whereas at the present time plants are represented by mere herbage of small size with stems and branches scarcely as thick as a goose quill.

The first growth was generally floating or creeping plants and was essentially composed of a peculiar species, the Stigmaria, whose unusually long stems and branches from 4 to 6 ft. thick, were woven together into a mat or thick carpet over which the luxuriant land vegetation



Sketch Showing Deposition of Peat

spread itself. Such a mass of vegetation naturally sank of its own weight at times and places, until wholly submerged. This hypothesis is proved by the superposition of the beds of sandstone, shale, clay, ironstone and limestone upon the old coal beds.

The measures containing the coal seams were laid in salt, brackish or fresh water and vary accordingly. If the salt water had found its way into the life of the jungles and forests they would have been destroyed. At that time the encroaching water occasionally flowed with great and plunging waves, as is shown, not only by the coarse gravel beds of conglomerate, but also by the erosion of rock deposits, and in some cases the vegetable *débris* was washed away making what we call faults. Geologists admit that in some regions the coal plants may have been drifted to their place of deposit.

Subsidence and Compression of the Coal Measures

To account for the succession of coal beds separated from each other by many feet of strata, constituting a mass of coal measures several thousand feet in total thickness, it is necessary to take into consideration the slow subsidence of large areas of the earth's surface; these have taken place in all geological ages and were nearly continuous on a grand scale during the whole time in which the numerous formations of middle and western Pennsylvania were being deposited, ending with the rise of the whole region to its present height, at the end of the coal periods. During the last part of the downward movement the coal vegetation flourished magnificently but was interrupted by inroads of the sea on an equally grand scale, which explains the intermediate sandstones, shales, limestones, and iron-ore beds. The plant life was precisely similar but vastly greater and perhaps more long-lived than the plants composing the peat bogs of our day.

From all that has been said, it plainly appears that in the growth of the peat, we have microcosmic, but true, representation of the formation of coal. A coal bed itself bears evidence of alterations of conditions in its own lamination, and even in the alteration in shades and colors. A layer of one-eighth of an inch in thickness corresponds to an inch, at least, of the accumulating vegetable remains and, hence, the regularity and delicacy of structure is not surprising.

There may have been great variations in the length of time before the peat-like vegetation, after forming, was covered with water, which would cause a varied quality of coal due to the pressure of the beds of clay and sand. The decomposition of the vegetation depended on the amount of water, the composition of that water, and the length of time exposed. In some parts of the marsh, there were pools where the vegetation was long steeping and so became reduced to pulp, thus obliterating all bedding planes. The coal period was a time of increasing change, eras of verdure, alternating with those of widespread inundation destructive to all the vegetation and terrestrial life, except that which covered the region beyond the coal measures. Yet it was an era in which the changes went forward for the most part with such extreme slowness and with such prevailing quiet, that if a man had been living at that time, he would not have suspected the change.

The Change of Wood into Coal

All organic materials tend to decay and in this the chief process is oxidation; oxides are the largest part or all of the final result. Wood, when thoroughly dried, consists approximately of the following percentages: Carbon, 49.66; hydrogen, 6.21; oxygen, 43.03; nitrogen, 1.10 and traces of sulphur and phosphorus; animal fat contains the same elements. In smothered combustion, as in making charcoal by burning wood under a cover of earth, nearly all of the hydrogen and oxygen disappear in carbon monoxide, carbon dioxide and water, without the consumption of all the carbon. This also occurs when the plants decompose under a complete covering of water or earth, because this excludes the air and confines the change to the elements of the plant and the more complete the protection the greater will be the proportion of carbon and hydrogen saved. In the change of ordinary bituminous coal, the loss in the hydrogen in wood as compared with carbon is about 2 to 5 and to that of oxygen about 4 to 5. About 5.5 per cent. of such coal (ash excluded) is hydrogen and 12 to 15 per cent. oxygen, with 80 to 81 per cent. carbon. Mineral coal consists chiefly of carbon. Anthracite contains, usually, 2 to 5 per cent. of oxygen and hydrogen, and bituminous often 12 per cent., by weight, of oxygen and 4 to 6 per cent of hydrogen, while brown coal contains 20 per cent. or more of oxygen, with 5 to 6 per cent. of hydrogen.

The process of conversion of woody material into coal is shown in the following table:

	C.	H.	O.	N.
Wood	49.66	6.21	43.03	1.10
Peat	59.5	5.5	33.00	2.0
Bituminous	81.2	5.5	12.5	0.06
Anthracite	95.0	2.5	2.5	0.00

It is probable that in the formation of bituminous coal, at least three-fifths of the ingredients of the original

wood was lost, and in anthracite about three-fourths. Besides this reduction of two-fifths and one-fourth by decomposition there is a reduction of bulk by compression, which, if only one-half, would bring the total up to one-fifth or one-eighth. On this estimate it would take 5 ft. in depth of compact vegetable *débris* to make one foot of bituminous coal, and 8 ft. to make one foot of anthracite. For a bed containing 55 ft. of pure coal, like that at our Greenwood Colliery, the bed of vegetation should have been at least 440 ft. thick .

Anthracite coal is a result of the action of heat on bituminous coal under the pressure which accompanied the upturning of the rocks, the heat driving off nearly all the volatile matter, and leaving the anthracite behind Anthracite in eastern Pennsylvania is due to the action of heat on ordinary bituminous coal, caused by the upturned and flexed condition of the rocks in that part of the state. The upturning fades out to the north westward and the Wilkes Barre anthracite region is on its outskirts. The conversion of bituminous to anthracite coal would not require any great amount of heat nor heat of prolonged duration. Moreover, it would have spread laterally from the area of greatest disturbance, as is well exemplified in the various metamorphic regions.

The following are the facts governing the origin of coal:

First—The coal of the upturned and more or less metamorphic coal measures of Rhode Island is the hardest of anthracite.

Secondly—The coal of the Carboniferous coal measures of western Pennsylvania and that of the states farther west, where beds are nearly horizontal, is uniformly bituminous and not anthracite.

Thirdly—Variations in the condition of the coal making eras over the whole globe have led to various kinds of coal without making anthracite. Brown coal, or that containing a large percentage of oxygen, is known to form where there is much excess of air. Cannel coal, a kind rich in oil producing hydrocarbons and little oxygen, was formed by prolonged steeping beneath a deep cover of sediments. Graphite, a grade beyond anthracite, is formed from the excessive heating of mineral coal, as is proved in the metamorphic regions of Rhode Island and Worcester.

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An Improved Steel Mine Car

By Alfred C. Fickes*

SYNOPSIS—These cars have a capacity of nearly three tons run-of-mine coal and weigh over 5200 lb., yet they are so constructed that one man can easily push them about upon a level track or even a slight grade.

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As the use of steel mine-cars is becoming more general every day, a description of an advanced type recently put in service by the Lehigh Coal and Navigation Co., will be, perhaps, not altogether inappropriate.

The Car Is Practically All Steel

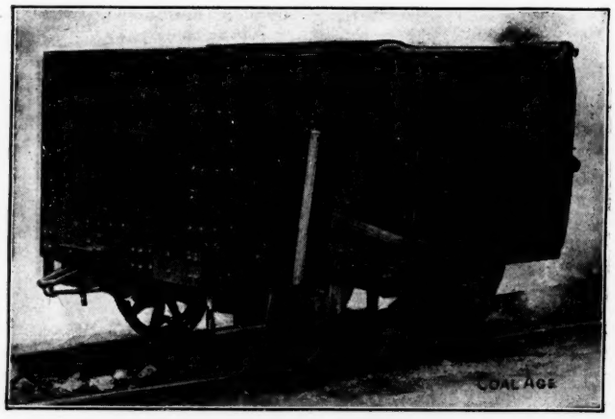
The car weighs 5204 lb. and is composed almost entirely of steel and wrought iron. The wheels, brake-shoes and pedestal-box lids are the only parts constructed of cast iron. The pedestal boxes and bearings are made of malleable iron, while the pedestals, couplers, door-brackets, etc., are made of cast steel, there being eleven various parts composed of this material.

The car is constructed for a gage of 3 ft. 6 in., the general dimensions being shown on the accompanying drawing. The capacity is 115.43 cubic feet, top-level full, or about 2⅞ tons of run-of-mine coal.

The L. C. & N. Co. has been experimenting with part steel and all-steel mine-cars for some years with various degrees of success, having made up cars ranging in weight from 4150 to 5530 lb. The new car was designed at the Lansford shops, under the supervision of Robert E. Hobart, master mechanic, who has had much experience along these lines and who has endeavored to embody all the good features of former cars without their disadvantages, at the same time introducing improvements wherever possible. The present car contains the latest features of car design.

The sides and bottom are made of ¼-in. steel, strongly reinforced with heavy angles and channels. A heavy strap-brace of 1x4-in. iron is placed across the top of the car at the center. With the exception of the slightly protruding brake, there are no projections on the outside of the body, while on the inside, all the rivets are flattened.

One of the improved features is the brake, which is operated on the rachet principle from either side of the



General View of the Car

car. A workman can easily operate this mechanism by running alongside, lifting the brake-lever and engaging it in the rachet, thereby setting in motion the levers and operating the brake-shoes. As these latter wear, an adjustment is easily made by means of shifting holes on the brake-arms. In localities where steep pitches are common, it is easy to discern the advantages of the brake over spragging.

The 20-in. wheels are spoked and can be spragged if necessary. They weigh 177 lb. each.

Another notable improvement has been made in the

*Lansford, Penn.

couplers. They are equipped with 1-in. round steel spiral springs and have been found to decrease considerably the strain on the locomotives hauling the trips, especially in starting. The compression and pull on these cars are both on center. The impact being deadened greatly reduces the wear on couplers, which in the old-style cars ran into a considerable sum of money annually for repairs and replacements. Instead of the usual three-link coupling but one link is used.

The axles are made from 3⅜-in. stock, turned down to 3¼ in. in the center and 3 in. at the wheels and journals. The ends of the axles project beyond the wheels as shown and are inclosed by the bearings and pedestal-boxes. Ordinary car-oil is used for lubrication and the boxes are packed with waste to keep out dust and dirt and prevent leakage of the oil. The pedestal-box lids are fastened to the boxes by ¼-in. round iron chain to prevent being lost.

Journal Boxes Are Carried on Springs

The shock on the bearings is reduced to a minimum by the use of ⅞-in. square steel spiral springs, each figured for 5800-lb. safe load. Every effort has been made to produce an easy-runnnig car in spite of the great weight and as one man can readily push a car about on the level, or even on a slight grade, it would indicate that these efforts have been successful.

Last February, 175 of these cars were placed in service on the Springdale run at Coaldale Colliery and are doing good work. These were fabricated by the American Car & Foundry Co. Orders have been placed for 400 additional cars and the Lansford shops are now building them in large numbers.

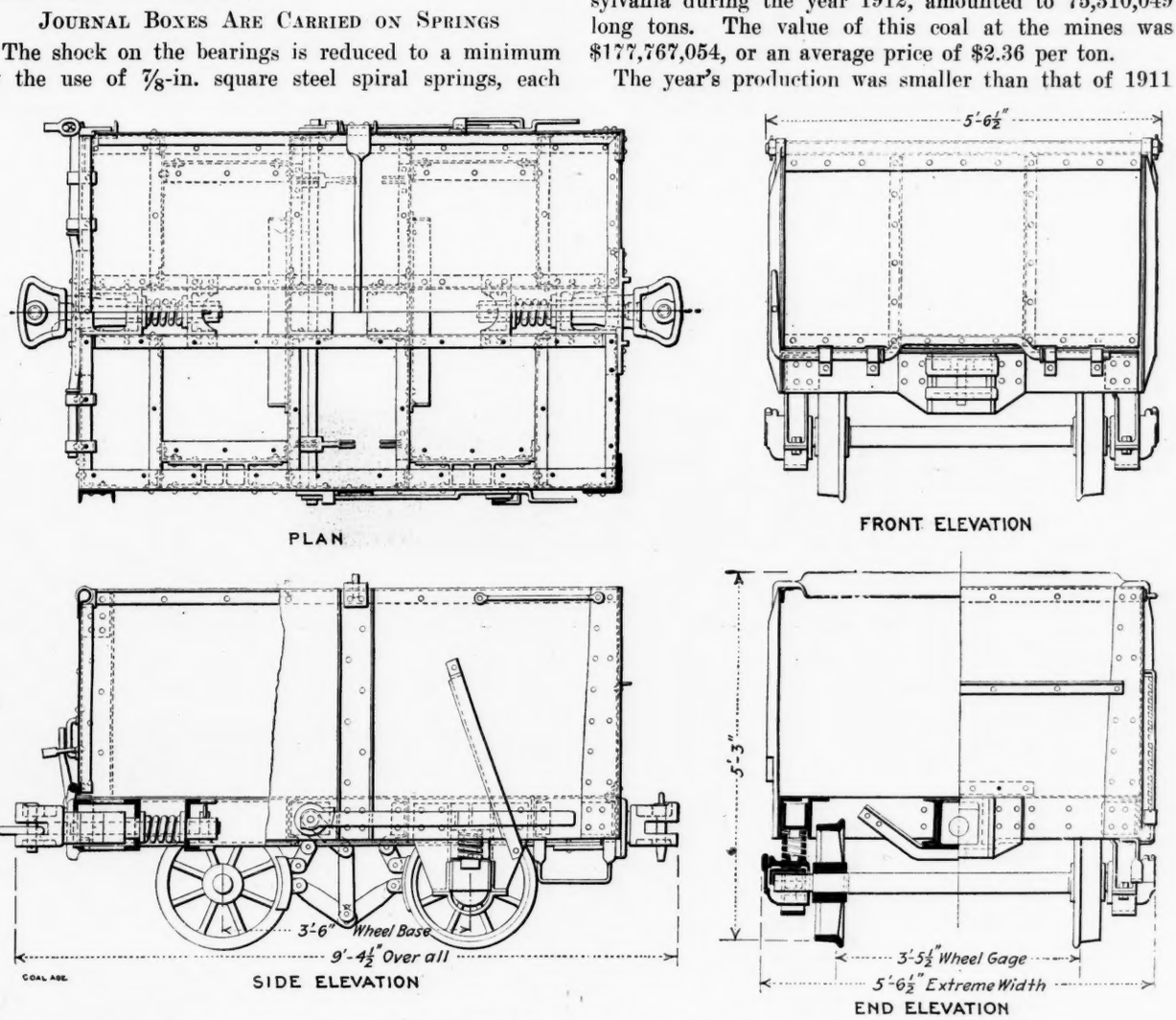
This type of car costs approximately 40% more than the style formerly used by this company. It is the intention however to replace the old ones as fast as possible and manufacture the new style exclusively in the future, modified, of course, or improved wherever conditions warrant.

Last Year's Anthracite Production

According to the figures of the United States Geological Survey, the production of anthracite coal in Pennsylvania during the year 1912, amounted to 75,310,049 long tons. The value of this coal at the mines was $177,767,054, or an average price of $2.36 per ton.

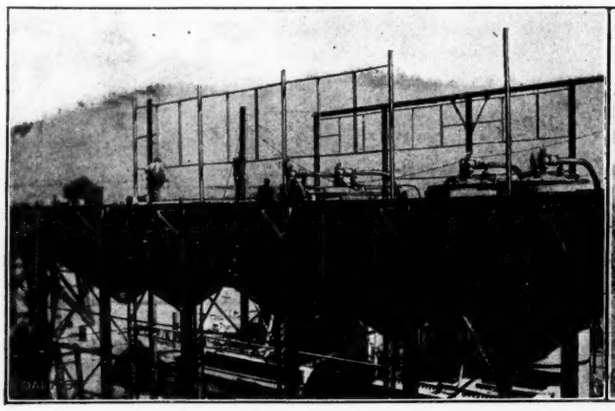
The year's production was smaller than that of 1911 by approximately five and one-half million tons; but its value was greater by over $2,800,000.

The present average price at the mine is greater than at any previous time, the highest price charged before being $2.28 per ton in the year 1903.

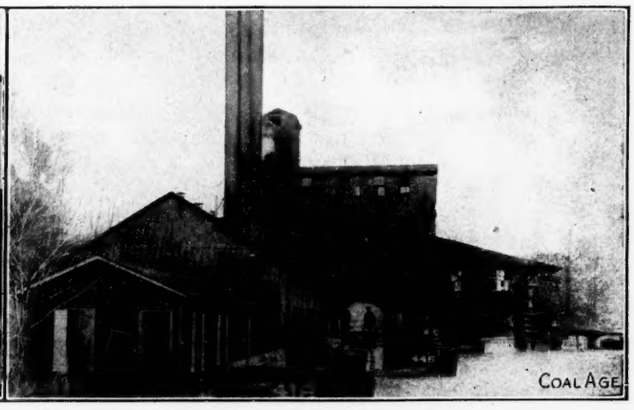


Details of Construction. Note Spring Drawheads, Spring-Supported Journal Boxes, and Ratchet Brake

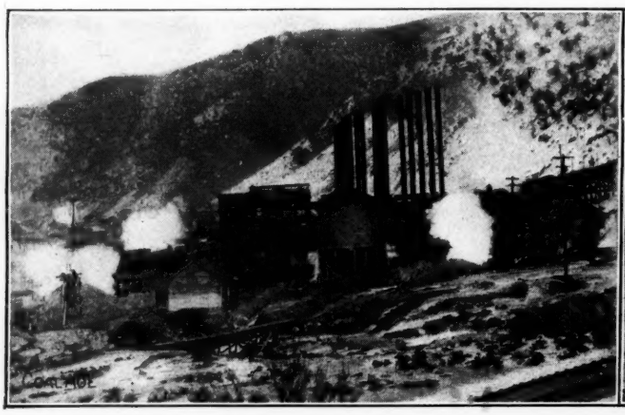
SNAP SHOTS IN COAL MINING



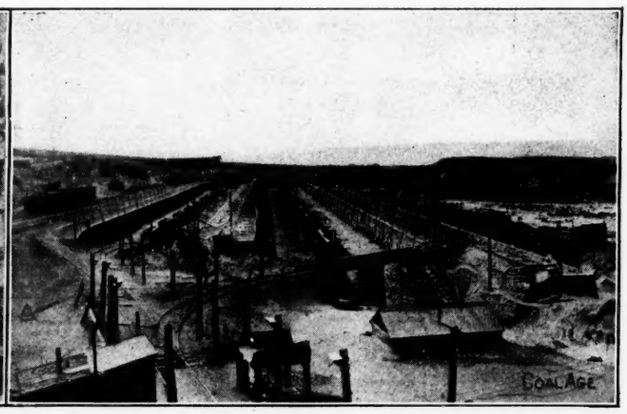
Coal Bunkers in the Hastings Central Power Plant of Trinidad E. T. R. & G. Co., in Colorado



Mining under Difficulties. Recent Ohio Valley Floods at Spottsville on Green River in Kentucky

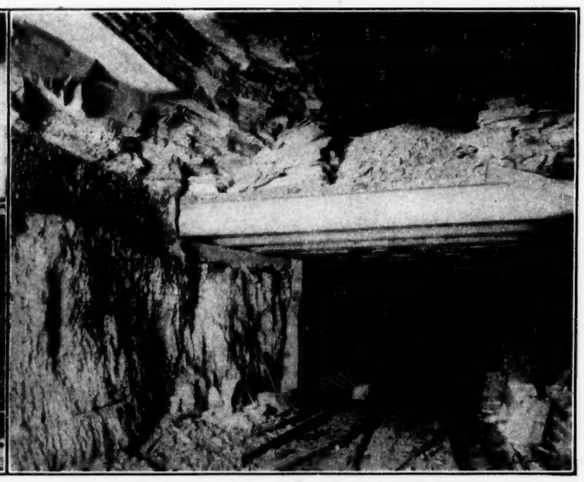


Tipple and Power House of the Utah Fuel Co., at Sunnyside, Utah



General View of the "Old" Coke-Oven Installation at Sunnyside, in Utah

Tipple of the Rose Creek Coal Co., at Coyletown, Ky.



Steel I-Beams in No. 8 Mine, Madison Coal Corp., Dewmanie, Ill.

Non-Fatal Injuries in Anthracite Mines

By F. L. Hoffman*

SYNOPSIS—The author points out that workmen's compensation is about to become universal without any data being available in the United States from which the probable rate of injury per 1000 men employed can be determined. The records covering only serious injuries are inadequate, as comparisons with British statistics amply prove.

The increasing extent to which employers' liability laws are being replaced by workmen's compensation statutes makes it important that the nature of industrial accidents should be much better understood than they are at present. In a few of the annual reports of state mine inspectors, the information is given in sufficient detail to disclose the nature of the injuries, as well as their causes, and the resulting degree of incapacity for work. It would serve a most useful public purpose if mine inspectors were to present the facts in a more convenient form, and, as a suggestion towards a feasible method of statistical research, the following tables and observations are presented as a first contribution towards a subject which has heretofore been much neglected.

The Pennsylvania Records

As a rule, the information concerning mine accidents is limited to a statement of the number of fatal and non-fatal injuries and their causes. But fortunately, in the reports of the Pennsylvania Department of Mines, additional information is supplied as regards the nature of the injuries sustained, but the data are not presented in the form of a convenient summary or made the subject of critical analysis. The total number of such accidents during 1907-11 was 5745, equivalent to a non-fatal accident rate of 6.7 per 1000 employed.

Since the fatality rate for the same period was 3.8 per 1000, it requires no extended analysis to sustain the conclusion that the non-fatal accidents are far from being fully reported, and that a thorough revision of the methods by which records of such accidents are obtained is urgently needed. Granting that the most serious accidents are of most importance from a medical, legal, social or economic point of view, it is nevertheless true that a large number and proportion of less serious non-fatal injuries occur, for which compensation would be required under the operation of more or less drastic compensation laws.

In Great Britain 105 Are Injured to One Killed

As perhaps the best illustration of existing defects in the reporting of non-fatal mine injuries, attention may be directed to the British experiences for 1911, as reported in the statistics of compensation and of proceedings under the Workmen's Compensation Act of 1906, and the Employers' Liability Act of 1880. According to this return, the number of persons employed in mines was 1,059,642, and among this number there occurred 1711 fatal accidents and 178,466 non-fatal accidents. The fatality rate was, therefore, 1.6 per 1000, and the non-fatal accident rate was 168.4 per 1000. The ratio of fatal to non-fatal accidents was, therefore, as 1 to 105.

*Statistician, Prudential Insurance Co., Newark, N. J.

If the ratio of non-fatal to fatal accidents for British mines is applied to the Pennsylvania anthracite collieries, the resulting number of non-fatal accidents during the five-year period ending with 1911 would be 144,148 against 5745 as actually reported. Granting that possibly the non-fatal accident rate is much less in the Pennsylvania anthracite mines than in British coal and metalliferous mines combined, the fact remains that the returns of non-fatal injuries, as at present made, are unquestionably untrustworthy and a serious understatement of the facts.

To secure more trustworthy and complete returns it is essential that the term "accident" should be defined in the law and general usage, and that uniform rules of statistical practice should be agreed upon by the mine inspectors of the several coal-producing states. Such a definition, to be trustworthy, should provide for information regarding the resulting duration of incapacity for work, and the importance of such a requirement is best illustrated in the British statistics, according to which, of the non-fatal accidents reported during 1911, 60.6 per cent. caused a work incapacity of less than four weeks.

TABLE I. DURATION OF INCAPACITY FOR WORK, OR PERIOD FOR WHICH COMPENSATION WAS PAID

Compensation Paid (weeks)	Mining	Quarrying	Railroad Employees*	Dock Laborers	Shipping Steam	Shipping Sailing
Under 2	6.1	7.9	16.0	9.7	6.3	2.5
2—3	35.1	30.2	28.9	23.1	20.4	12.2
3—4	19.4	18.2	17.4	18.1	15.4	15.7
4—13	34.3	38.4	31.8	41.9	45.3	52.8
13—26	3.5	4.0	4.0	5.0	8.4	12.5
26+	1.6	1.3	1.9	2.2	4.2	4.3
	100.0	100.0	100.0	100.0	100.0	100.0

* Excepting clerical staff.

According to this table, of the mine accidents, 5.1 per cent. required compensation for 13 weeks or more as against 16.8 per cent. for men employed on sailing vessels, and 12.6 per cent. for men employed in steam navigation. The table emphasizes the wide divergence in the economic consequences of non-fatal injuries, which by modern conceptions of legal responsibility will probably require to be provided for by the compensation of the injured employee by the employer, who, as far as practicable, will shift the expense upon the cost of production.

Are Returns Less Accurate or Mines More Safe?

As stated at the outset, the non-fatal accident returns for the anthracite coal mines of Pennsylvania are without doubt seriously defective. Since the returns do not show the duration of resulting incapacity for work, it is impossible to say whether the defect in the returns is limited to accidents of comparatively small economic importance, or to all classes, excepting, perhaps, the most serious. The table which follows seems to show that the tendency is rather towards diminished accuracy or completeness, for against a rate of 8.11 in 1907 the reported rate for 1911 was only 6.48 per 1000 employed.

TABLE II. NON-FATAL ACCIDENTS IN PENNSYLVANIA ANTHRACITE COAL MINES, 1907-1911

Year	Employees	Accidents	Rate per 1000 Employed
1907	168,774	1369	8.11
1908	174,503	1170	6.70
1909	171,195	1034	6.04
1910	168,175	1048	6.23
1911	173,338	1124	6.48
Total	855,985	5745	6.71

The analysis which follows is for a five-year period, since a study of the facts by single years would have required much more space than is available for a discussion of this kind.

Considering first the age distribution of the injured, the table below gives the required information by divisional periods of life. It has not seemed necessary to extend the analysis to single years of life, since the frequency distribution is quite well emphasized by the less elaborate and more convenient method.

TABLE III. AGE DISTRIBUTION OF PERSONS INJURED IN NON-FATAL ACCIDENTS IN PENNSYLVANIA ANTHRACITE COAL MINES, 1907-1911

Ages	Number Injured	Per cent. of Total	Ages	Number Injured	Per cent. of Total
12—14	18	0.3	45—49	418	7.3
15—19	825	14.4	50—54	251	4.4
20—24	1000	17.4	55—59	135	2.3
25—29	949	16.5	60—64	60	1.0
30—34	809	14.1	65+	49	0.9
35—39	686	11.9	Unknown	2	...
40—44	543	9.5			
			Total:	5745	100.0

The value of the foregoing table is materially impaired by the fact that the age distribution of the men employed in anthracite mines is at present not known. It is possible that the forthcoming results of the Twelfth Census may give the required information, but in view of the curtailment of census appropriations, it is doubtful whether the analysis was extended, as indeed is desirable, to the age distribution of occupations by divisional periods of life.

The Relation of Place of Birth to the Accident Rate

The same conclusion, in part, applies to the factors of race and nativity, which also have an important bearing upon the frequency of accident occurrence. As shown by the table, which follows, the proportion of Polish mine workers injured during the five-year period was 25.1 per cent. or not much less than the proportion of native-born Americans, returned as 26.6 per cent. A serious question may be raised, however, as regards the accuracy of the nativity returns, since it is difficult to believe, for illustration, that the number of Magyars and Greeks, as well as Austrians, was not larger than actually reported. Apparently, many men of these nativities were returned as Slavs, which is a rather indefinite term in popular usage, although ethnologically well defined and understood.

TABLE IV. NATIVITY OF PERSONS INJURED IN NON-FATAL ACCIDENTS IN PENNSYLVANIA ANTHRACITE COAL MINES, 1907-1911

Nativity	Number Injured	Per cent. of Total	Nativity	Number Injured	Per cent. of Total
American	1530	26.6	Lithuanian	529	9.2
Arabian	2	0.0	Magyar	3	0.1
Austrian	161	2.8	Mexican	1	0.0
Bohemian	2	0.0	Montenegrin	2	0.0
English	157	2.7	Norwegian	1	0.0
Finnish	7	0.1	Polish	1442	25.1
French	6	0.1	Russian	261	4.5
German	147	2.6	Scotch	19	0.3
Greek	12	0.2	Slavish	379	6.6
Horvat (Croatian)	3	0.1	Swedish	11	0.2
Hungarian	141	2.5	Syrian	3	0.1
Irish	308	5.4	Tyrolean	18	0.3
Italian	391	6.8	Welsh	209	3.6
			Total:	5745	100.0

Conjugal Condition

The same conclusion as to inherent inaccuracy would seem to apply to the returns as to conjugal condition. Out of 5745 injured mine employees, 56.1 per cent. were returned as married, 43.6 per cent. as single, but only 0.1 per cent. as widowers. It is practically certain that the widowers were returned as married, in conformity to local usage. From a legal point of view, in connection with workmen's compensation legislation, it is of considerable importance that returns of this kind should be accurate and conclusive, since the compensation rates vary according to the relationship of dependent survivors.

TABLE V. CAUSES OF NON-FATAL ACCIDENTS IN THE ANTHRACITE COAL MINES OF PENNSYLVANIA, 1907-1911

	Fall of coal	Fall of rock or slate	Falls into shafts	Mine cars	Explosions of: gas or dust	Explosions of: powder	Explosions of: blasts	Explosions of: boilers	Machinery	Electricity	Horses or mules	Timber	Miscellaneous	Total
Inside employees														
Mine foremen	3	3	3	11	3	2	...	..	..	..	3	1	8	37
Asst. mine formen	1	1	3	6	8	1	...	..	1	..	1	..	3	25
Firebosses	2	1	..	5	12	..	1	..	..	..	..	..	1	22
Miners	549	702	46	170	372	152	203	..	9	..	5	8	109	2325
Miners' laborers	214	454	49	378	127	56	38	8	20	2	7	53	114	1520
Drivers and runners	17	41	11	601	20	6	4	..	17	2	74	5	62	860
Door boys and helpers	..	..	..	62	5	1	..	..	..	2	5	1	9	85
Pumpmen	2	2	1	2	3	..	..	1	..	..	..	..	10	21
Company men	11	33	7	61	17	2	4	..	4	2	7	8	44	200
Other inside	22	29	17	84	19	8	3	2	4	..	3	6	34	231
Total	821	1266	137	1380	586	228	253	11	55	8	105	82	394	5326
Outside employees														
Superintendents	..	..	..	1	2	..	..	..	..	..	..	1	1	5
Foremen	..	1	..	..	2	..	..	..	1	..	..	..	6	10
Blacksmiths and carpenters	1	7	7	16	..	..	2	..	6	1	..	11	15	66
Engineers and firemen	1	4	2	29	1	..	..	9	5	1	..	1	23	76
Slate pickers	1	2	18	14	..	4	..	2	7	..	6	10	45	109
Bookkeepers, etc.	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Other outside	4	8	15	46	3	2	1	4	24	..	1	1	44	153
Total	7	22	42	106	8	6	3	15	43	2	7	24	134	419
Grand total	828	1288	179	1486	594	234	256	26	98	10	112	106	528	5740
Per cent.	14.4	22.4	3.1	25.9	10.3	4.1	4.5	0.5	1.7	0.2	1.9	1.8	9.2	100.5

The causes of injuries have been classified in reasonable detail in the table which follows, and the minor occupations have been grouped on account of the required limitation of space. For scientific purposes the occupations in detail would be of considerable importance, but the value of the analysis diminishes on account of decreasing numbers by minute classification, which can only be made to advantage for a much longer period of time or upon the basis of much more complete returns than are at present available.

Table V is self-explanatory and requires no extended discussion. It is shown that of the accidents reported, 25.9 per cent. were due to mine cars, 22.4 per cent. to falls of rock or slate, 14.4 per cent. to falls of coal, and 10.3 per cent. to gas or dust explosions. These four principal groups of causes, therefore, accounted for 73 per cent. of the non-fatal accidents from all causes.

Nature of Injuries

The foregoing discussion has been with reference to the general facts of non-fatal injuries in anthracite mines, which it is necessary to take into consideration in a subsequent discussion of the nature of the injuries sustained.

TABLE VI. PARTS OF THE BODY INJURED IN NON-FATAL ACCIDENTS IN THE ANTHRACITE MINES OF PENNSYLVANIA, 1907–1911

Occupation	Number of employees	Head	Face	Eye	Eyes	Nose	Shoulder	Shoulders	Arm	Arms	Wrist	Wrists	Hand	Hands	Finger	Fingers	Collar-bone	Collar-bones	Rib	Ribs	Trunk	Hip	Hips	Leg	Legs	Knee	Knees
Inside employees																											
Mine foremen	2,128	1	..	..	..	..	2	..	..	..	..	..	..	..	..	..	1	..	..	1	1	..	2	10	..	2	..
Asst. mine foremen	3,676	..	..	..	..	1	..	..	1	..	..	..	1	..	..	..	..	..	..	1	1	..	..	7	1	1	..
Firebosses	3,728	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	..	..	..	3	..	..	..
Miners	221,025	105	38	9	10	5	21	..	99	3	1	2	28	15	15	19	44	..	13	74	157	62	12	561	8	4	4
Miners' laborers	160,014	88	45	4	18	11	19	10	79	9	4	..	10	12	14	10	32	..	7	34	48	25	7	574	15	8	1
Drivers and runners	58,983	34	15	1	..	3	11	2	96	1	9	1	18	6	22	15	25	6	4	24	31	16	21	245	13	12	1
Door boys and helpers	13,560	3	1	..	..	..	2	..	10	1	1	..	..	..	..	1	4	..	1	2	3	1	1	28	..	6	..
Pumpmen	5,468	1	..	..	..	..	1	..	4	..	..	..	..	1	..	..	..	..	1	1	2	..	..	3	..	..	..
Company men	65,461	5	1	2	2	..	..	1	13	..	3	..	3	2	1	2	6	..	2	11	4	4	2	66	2	3	..
Other inside employees	78,890	10	3	..	..	..	4	1	27	1	..	1	8	5	4	3	5	1	1	6	8	3	2	54	12	4	..
Total	612,933	250	103	16	30	20	60	14	329	15	18	4	68	41	56	50	117	7	30	155	255	111	47	1551	51	40	6
Outside employees																											
Superintendents	707	..	1	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..
Foremen	2,158	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	1	..	1	..	..	..
Blacksmiths and carpenters	14,191	5	..	1	..	1	4	..	8	..	1	..	..	..	3	2	..	..	2	4	3	2	..	14	..	..	..
Engineers and firemen	29,832	4	..	1	..	1	1	1	9	..	..	..	1	..	2	1	2	..	1	4	4	..	..	16	1	1	..
Slate pickers	61,333	8	1	..	..	1	2	2	25	1	4	..	2	1	..	2	1	..	..	1	3	1	..	25	8	..	..
Bookkeepers and clerks	4,313	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Other outside employees	130,518	8	..	2	..	1	1	..	27	..	1	..	5	2	7	3	3	..	..	4	5	1	1	44	2	2	..
Total	243,052	25	2	4	0	4	8	4	71	1	6	0	8	3	12	8	6	0	3	13	15	5	1	101	11	3	0
Grand total	855,985	275	105	20	30	24	68	18	400	16	24	4	76	44	68	58	123	7	33	168	270	116	48	1,652	62	43	6
Percentage		4.8	1.8	0.3	0.5	0.4	1.2	0.3	7.0	0.3	0.4	0.1	1.3	0.8	1.2	1.0	2.1	0.1	0.6	2.9	4.7	2.0	0.8	28.8	1.1	0.7	0.1

Occupation	Ankle	Ankles	Foot	Feet	Toe	Toes	Internal	Not Specified	Eye and other	Eyes and other	Leg and other	Legs and other	Arm and other	Arms and other	Hand and other	Hands and other	Finger and other	Face and other	Head and other	Other combinations	Total	Rate per 1000 employed
Inside employees																						
Mine foremen	2	1	2	..	..	..	..	2	..	..	1	..	1	..	..	5	..	..	..	3	37	13.6
Asst. mine foremen	..	..	..	..	..	..	1	2	..	..	..	..	..	..	1	5	..	2	..	..	25	6.8
Firebosses	..	..	..	..	..	..	..	5	..	..	..	..	..	..	2	5	..	..	..	2	22	5.9
Miners	45	2	44	1	9	8	5	221	3	1	26	6	13	3	7	281	1	160	25	155	2325	10.5
Miners' laborers	27	..	42	13	2	3	16	101	2	..	49	1	4	1	1	47	1	31	..	95	1520	9.5
Drivers and runners	14	9	44	4	5	4	15	35	..	..	4	4	5	1	1	8	1	4	3	67	860	14.6
Doorboys and helpers	..	..	2	..	..	..	..	10	..	..	..	..	..	..	3	3	..	..	..	2	85	6.3
Pumpmen	..	..	..	..	..	..	1	3	..	..	..	..	1	..	..	1	..	..	..	1	21	3.8
Company men	3	..	6	..	2	2	2	20	..	..	6	..	3	..	1	8	..	..	..	12	200	3.1
Other inside employees	5	..	5	..	1	3	4	15	..	..	2	4	..	..	1	9	..	3	2	14	231	2.9
Total	96	12	145	18	19	20	44	414	5	1	88	15	27	5	17	372	3	200	30	351	5326	8.7
Outside employees																						
Superintendents	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	1	..	..	..	..	5	7.1
Foremen	..	..	1	..	..	..	..	..	..	..	..	1	1	..	..	..	..	..	..	3	10	4.6
Blacksmiths and carpenters	..	..	2	..	..	1	..	3	..	..	..	..	..	..	1	..	..	..	1	8	66	4.7
Engineers and firemen	1	..	6	..	2	1	1	3	..	..	1	..	..	..	4	3	..	1	..	3	76	2.5
Slate pickers	1	..	6	..	..	2	..	5	..	..	..	..	1	..	..	..	..	..	..	6	109	1.8
Bookkeepers and clerks	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	....	...
Other outside employees	4	1	10	..	1	1	1	5	..	..	..	1	3	..	..	1	..	2	..	4	153	1.2
Total	6	1	25	0	3	5	3	16	0	0	1	2	5	C	5	5	0	3	1	24	419	1.7
Grand total	102	13	170	18	22	25	47	430	5	1	89	17	32	5	22	377	3	203	31	375	5745	6.7
Percentage	1.8	0.2	3.0	0.3	0.4	0.4	0.8	7.5	0.1	0.0	1.5	0.3	0.6	0.1	0.4	6.6	0.1	3.5	0.5	6.5	100.0	

It is much to be regretted that the reports do not state the duration of the injuries, since the total amount of compensation is naturally conditioned by the length of time for which the compensation is paid. To a certain extent, of course, the probable duration of injury is indicated by the nature of the injury sustained, and the following table gives in detail the single injuries as well as the complicated injuries where more than one part of the body was affected.

Considering the large number of complications possible, it has been necessary to combine some of the injuries, which, however, are not of sufficient numerical importance to affect the results. The proportion of not specified injuries was 7.5 per cent. of the whole, and of injuries combined but not available for tabular analysis, 6.5 per cent. The table exhibits the principal groups of occupations, together with the estimated number of employees for the five-year period, the percentage distribution of single and combined causes in detail, and the non-fatal accident rate per 1000 employed for each specified group.

The foregoing results have been summarized in the next and concluding table, in which the bodily injuries have been arranged somewhat in conformity to the human anatomy. This table is of unusual interest and is the first statement of its kind exhibiting with approximate accuracy, the nature of the injuries sustained in anthracite mining, with a due regard, however, to the necessity of combinations, and returns too indefinite for scientific classification. The proportion of

such returns and the data not available for analysis was 14 per cent. and to that extent the table is open to criticism, although there are no reasons for believing that any one class of minor injuries is more affected by this degree of uncertainty than another.

Most Accidents Are to Lower Extremities

The foregoing table exhibits the rate of non-fatal injuries according to their nature per 1000 employed, together with the percentage distribution of the injuries according to the part of the body affected. It is shown that the lower extremities, including the hips, represent the largest group, or 41.5 per cent. of the whole, followed by the upper extremities, including the shoulders, which account for 21.1 per cent. Injuries to the head, including the eyes and nose, account for 12.1 per cent., or about the same as injuries to the trunk, including the collar bones and internal injuries not otherwise specified, which account for 11.3 per cent.

TABLE VII. PARTS OF BODY INJURED IN NON-FATAL ACCIDENTS IN THE ANTHRACITE MINES OF PENNSYLVANIA, 1907-1911

Part injured	Number injured	Rate per 1,000 employed	Per cent. of total
Head	306	0.36	5.3
Face	308	0.36	5.4
Eyes	56	0.07	1.0
Nose	24	0.03	0.4
Total	694	0.81	12.1
Shoulder	86	0.10	1.5
Arm	453	0.53	7.9
Wrist	28	0.03	0.5
Hand	519	0.61	9.0
Finger	129	0.15	2.2
Total	1215	1.42	21.1
Collar bone	130	0.15	2.3
Rib	201	0.23	3.5
Trunk	270	0.32	4.7
Internal	47	0.05	0.8
Total	648	0.76	11.3
Hip	164	0.19	2.9
Leg	1820	2.13	31.7
Knee	49	0.06	0.9
Ankle	115	0.13	2.0
Foot	188	0.22	3.3
Toe	47	0.05	0.8
Total	2383	2.78	41.5
Other and not specified	805	0.94	14.0
Grand total	5745	6.71	100.0

In more detail, the most important cause of injuries was to the legs, or 31.7 per cent., followed by injuries to the hands, or 9.0 per cent., and to the arms, or 7.9 per cent. The analysis proves the economic importance of compensation, in that evidently a considerable amount of prolonged incapacity for work resulted from the injuries sustained. If the returns were more complete, it is safe to assume that the number of minor injuries would be largely of a nature not involving continued absence from work, or chiefly to the fingers, hands, wrists and feet, including ankles and toes. Eye injuries have been comparatively infrequent, at least of the most serious kind, for, according to the table, there were only 56 such injuries, equivalent to 1 per cent. of all injuries, or 0.07 per 1000 employed.

Internal Injuries Are Rare

Internal injuries also appear to have been comparatively rare, the actual number having been 47, and the proportion 0.8 per cent. of the whole, or 0.05 per 1000 employed. The relatively small number and proportion of internal injuries, however, is accounted for by the fact that most of such injuries in mine labor are followed by fatal results.

The foregoing discussion is merely intended as a brief contribution towards a better understanding of the accident problem in anthracite mining. The discussion suggests the economic importance of non-fatal mine injuries and the imperative necessity for more complete and, as far as practicable, uniform returns, to provide a better basis than is at present available for discussions of workmen's compensation problems in coal-producing states, with special reference to the needs of mine workers.

Definitions of Fatalities and Injuries

It may be suggested that every accident involving an absence from work of more than one day should be reported, and that accidents which do not result in death within seven days should be listed not as fatalities but as injuries. At present the definitions vary and accidents reported in one state as non-fatal would be reported in another as fatal. In order to avoid a subsequent correction of the record, after several months have intervened, most of the states class fatalities which occur long after the accident as merely injuries.

As a final illustration of the economic importance of the non-fatal accident problem, it may be pointed out that if the non-fatal accident rate experienced in the British mines is assumed to prevail in the Pennsylvania anthracite mines, the amount of compensation required on the British basis of $24.70 per accident, would have been $3,560,456. The amount requires only to be stated to emphasize the great practical importance to the employer, the employee and the state, of trustworthy accident statistics on the one hand, and of a thorough understanding of the facts on the other.

View of Kentucky First-Aid Meet

Showing the Teams Standing at Attention Ready to Commence Work

Meeting of Kentucky Mining Institute

SYNOPSIS—The spring meeting of the Kentucky Mining Institute was held in Lexington, Ky., May 16 and 17. In addition to several interesting papers which were read, there was a state-wide first-aid meet, with 24 teams competing.

The first-aid field meet held in connection with the spring meeting of the Kentucky Mining Institute at Lexington on May 16, took place on the athletic field of the State University.

An address of welcome was delivered by President Barker of the Kentucky College, after which there was a short drill by the cadets of the state school. Following this the first-aid teams lined up preparatory to commencing the contest. The events were as follows:

First Event—Lacerated wound in palm of left hand. Right-thigh compound fracture, bleeding, patient carried 50 ft. on an improvised stretcher. Full-team event.

Second Event—Treat burns of face, neck, ears and hands. Two men carry patient without stretcher. Two-man event.

Third Event—Dislocated shoulder left side; right foot mashed, bleeding. Full-team event.

Fourth Event—Man overcome by gas; one man shoulder, lift and carry to place of safety. Perform standard form of respiration. One-man event.

Fifth Event—Man to fall on electric wire; back down, unsconcious. Rescue, give artificial respiration, one minute; treat burns on back and right upper arm. Improvise stretchers; carry 50 ft.

LIST OF TEAMS

No. 1—Wallsend: James Dixon, captain; Robert Coswell, Thomas McDonald, James McGleneroy, James Wicks.

No. 2—Stearns Coal Co.: Earl Malley, captain; Brier Donaldson, Harry Donaldson, Sam McMurry, Clabe Brier, Elmer Chitwood.

No. 3—Rim No. 1: Anderson Manon, Harry W. Fritts, J. Grayson Ponder, Charles McPherson, John Shelton, Jim Stone, Captain. Instructed by Dr. E. M. Howard.

No. 4—Stearns, No. 2: Nels Robbins, captain; Will Taylor, Alec Taylor, Ben Sweet, Jacob Reeves, Louis Burnet.

No. 5—Barker, No. 1: J. W. Dean, captain; J. I. Stone, E. G. Moore, Henry Hubbard, James Hampton, Chas. Mailer, Joe Cox, Dr. B. E. Giannini.

No. 6—Luzerne.

No. 7—Arjay: Sid Ingram, captain; R. A. Billings, L. M. Disney, R. F. Frye, Walter Fortner, Joe C. Cobb, Dr. Fred D. Haston.

No. 8—St. Bernard Coal Co.: Tom Peyton, captain; Wads Cole, F. Griffin, Chas. Ray, James Cloren, Will Donnelly.

No. 9—Barker No. 2: William Taulbee, captain; Charles Pressnell, John Sutton, J. S. Dozier, Perry Lone, Chas. Moore, Dr. B. E. Giannini.

No. 10—Jenkins No. 1: Lester Shrum, captain; Louis Biggs, James Walker, G. W. Rucker, Forest Bice, Thad Shunk.

No. 11—Rim No. 2: John Clark, captain, Ben Stone, Halsey Johnstone, William Anderson, James Phillips, Charles Rollins; instructed by Dr. E. M. Howard.

No. 12—Stearns Coal Co., No. 3: Joe Henry, captain; Lee Tourds, Sid King, Oscar Ross, Jim Strunk, Silas Jones.

No. 13—Glendon: John Onks, captain; Frank Bowman, John T. Lackard, Jim Lay, Bentley Messer, Dr. Fred D. Haston.

No. 14—Van Lear: J. P. Jennings, captain; Noah Henson, William Joushon, J. M. Stambaugh, Grover Wolf, Carl Picklesiner.

No. 15—Castro: James Hyatt, captain; Wilson Spivy, Walter Lock, Walter Green, Elijah Burke, Tip Jackson.

No. 16—Graham: W. B. Hager, captain; S. E. Hite, W. L. Cash, P. H. Morgan, T. J. Vinson, J. H. Spencer. W. D. Duncan Coal Co., of Greenville, Ky.

No. 17: Geraldine: Smith Snow, captain: William J. Black, Ed. Whittaker, Ballard Mattimgly, Harvey Markham, Floyd Mills, Dr. F. D. Haston.

No. 18—Stearns No. 4—Reason Cecil, captain; Ed. Winchester, John Smith, John Hifdon, Jim De Prossett, Bill Bowman.

No. 19—Cary: Ed. Duncan, captain; John Stillings, Frank Bradshaw, Francis Dunn, Thad Idol, Will France.

No. 20—Stearns, No. 5: Noble Stevens, captain; Dault Boyce, Edgar Phillips, Carl Fleming, Homer Stevens, George Smith.

No. 21—Auxier: John Ward, captain; M. L. Cornutte, John Coyer, Dave Corder, A. M. Alley, Ancil Rogers, Northeast Coal Co.

No. 22—Benham: L. D. Smith, Verner Luigart, J. R. Foster, Orby Hall, Orion Kelly. Wisconsin Steel Co.

The colored teams, Barker No. 3 and Rim No. 3, from the Continental Coal Corporation competed for Events 3, 4 and 5.

PRIZES

First prize, a silver loving cup, donated by the Goodman Manufacturing Co., of Chicago, and $60 in cash donated by the Jeffrey Manufacturing Co., of Columbus, was tied for by the following teams:

Team No. 9, Barker No. 2, Continental Corporation, 99 1/5 per cent.; team No. 22, Benham, Wisconsin Steel Co., 99 1/5. By agreement the money was divided and the cup was given to the Benham team to keep for six months, when it will be sent to the Pineville team and at the meeting in October it will be contested for as a side event between these two teams.

Second prize, a Johnson & Johnson first-aid cabinet, one Woods emergency case, five copies of Johnson's First-Aid Manual, and one-half dozen rubber-cloth covered first-aid packets. Won by team No. 10, Jenkins, Consolidation Coal Co., 98 4/5.

Third prize, an electric-lamp outfit and a safety lamp. Won by team No. 8, St. Bernard Mining Co., Earlington, Ky., 98 1/5.

Fourth prize, clock mounted in cannel coal. Was won by team No. 3, Rim No. 1, Continental Coal Corporation, 98.

Colored teams, Barker No. 3, 91⅗, Rim No. 3, 95.

RATINGS

No. 1, 92; No. 2, 97 1/5; No. 3, 98; No. 4, 95 2/5; No. 5, 97 3/5; No. 6, 75 4/5; No. 7, 97; No. 8, 98 1/5; No. 10, 98 4/5; No. 11 96 4/5; No. 12, 97 1/5; No. 13, 94 3/5; No. 14, 96; No. 15, 93 2/5 No. 16, 95 3/5; No. 17, 96; No. 18, 96 2/5; No. 19, 97 4/5; No. 20, 95 1/5; No. 21, 97 4/5; No. 22, 99 1/5.

The prizes were awarded by Prof. Norwood, chief state mine inspector. President Barker of the University also presented each team with a banner, and Mr. Wilson, Chief Engineer of the U. S. Bureau of Mines, presented a dozen medals to the teams, giving one medal to each of the twelve teams scoring the highest number of points.

In the evening, at 7:30, a banquet was held at the Phoenix Hotel. Short addresses were delivered by E. W. Parker, Floyd W. Parsons, Pres. Rash, James W. Paul, J. E. Beebe, J. B. Johnston, E. B. Wilson, C. J. Norwood, W. A. Miller and W. L. Moss.

The Meeting Saturday Morning

On Saturday morning the convention of the Kentucky Mining Iistitute convened in the Civil Engineering Building of the State University. The meeting was called to order by President Rash. The convention then adopted a memorial to C. F. Frazier, mining engineer, Taylor Coal Co., Beaver Dam, Ky. Next was the reading of a paper by Dr. A. M. Peter on "Calorimeter Tests Made on Kentucky Coal." Then followed a paper on "Workmen's Compensation," by K. W. Meguire, president of the Snead & Meguire Coal Co., Louisville, Ky. Following this was another paper by W. C. Tucker, general superintendent of the Wisconsin Steel Co., Denham, Ky. Mr. Tucker discussed "welfare work." After Mr. Tucker came David Victor, chief mine inspector of the Consolidation Coal Co., Fairmont, W. Va., who read a paper on "How Best to Handle the Dry or Dusty Mine."

Because of trouble to the electrical apparatus of the University, it was found impossible to use the stereop-

ticon slides that were necessary to illustrate Mr. Wilbert A. Miller's paper on "Shortwall Mining." Pres. Rash announced, however, that this paper will appear in the proceedings of the Institute.

Next was a discussion on Mine Ventilation by Mr. Weinshank, after which President Rash made a short talk thanking the members of the Institute for the hearty coöperation they had rendered him during his term of office. He then called for nominations for a new president and Mr. Davies presented the name of White L Moss. The nomination of Mr. Moss was made unanimous, and he was elected president of the Institute for the ensuing year.

The committee on nominations reported further elections as follows: For secretary and treasurer, T. J. Barr; for vice-presidents from the following districts of Kentucky: For the central district, B. R. Hutchcraft; for the western district, T. E. Jenkins of Sturgis, Ky., and C. W. Taylor of the W. P. Duncan Coal Co.; for southeastern Kentucky, James Butler of Stearns, and W. C. Tucker of the Wisconsin Steel Co., Benham; for the northeastern district, L. G. Abbott and H. LaViers. There being no further nominations, the foregoing were duly elected to the offices suggested.

The meeting closed after a further discussion on ventilation by Messrs. Victor Weinshank and Paul.

Heat in the Volatile Matter of Coal

By Alfred M. Peter*

SYNOPSIS—The author endeavors to separate the heat of combustion of the volatile combustible matter in coal from that of the fixed carbon. He uses several analyses of coals from the Kentucky field and concludes that the bituminous matter from the Eastern field is more heat-giving than that from the Western. The heat from the volatile combustible matter is much greater than that from fixed carbon and appears to reach 17,412 B.t.u., whereas carbon on burning only generates 14,500.

During the years when the Kentucky Geological Survey was being conducted under the able and efficient directorship of Charles J. Norwood, with headquarters at State University, a number of calorimeter determinations were made upon samples of coal obtained from different mines in the state. For this work Prof. Norwood provided, first a Parr fuel calorimeter and later one of the Emerson design, the latter being a new form of the bomb type of calorimeter and capable of giving results as accurate as those obtainable with the other standard instruments of this type but much easier to manipulate and more rapid in action.

The determinations were made at different times by Prof. Norwood's assistants, Messrs. Quickel, McHargue and Calloway. Some of these results have been published in the report of progress of the survey for the years 1908 and 1909; some are to be found in the bulletins of the survey, part of which, however, are still in the hands of the public printer, and I believe some have never been published.

Is the Volatile Combustible in the Kentucky Coals All Equally Heat-Giving?

I intend to take only a few of the determinations, those which are most representative of the more important coal beds in the state, and I shall endeavor to ascertain whether that part of the coal which is both volatile and combustible is of equal heating value in all the coals presented, considering, of course, the quantity of such matter in the coal.

Where coal has a large amount of volatile combustible matter, we naturally expect it to have a high heating value because of the large amount of hydrocarbons which are contained in such matter. Hydrogen, on burning, produces 62,000 B.t.u. per pound, whereas carbon develops only 14,500 B.t.u., and for this reason we would expect matter containing hydrocarbons to give more heat than fixed carbon when burned.

On the other hand, volatile combustible matter contains more or less oxygen, and its presence indicates that the coal is more or less an oxidized product and, therefore, less capable on combustion of giving out all the heat which a completely unoxidized body would emit on burning. Moreover, in this volatile combustible part of coal, sulphur and nitrogen are included, the former having a low heat value, about 4000 B.t.u. per pound when burning, and the latter oxidizing with the emission of but little heat. In the incombustible volatile matter, more or less water is found. This is derived from the clay which forms after burning a part of the ash constituent. Thus, if the volatile matter has a varying composition, it may have a variant ability to emit heat when burned.

I propose to estimate the heat in this volatile part of the coal by deducting the heat generated by burning fixed carbon or coke from that which is obtained when the original sample is burned. This deduction for the heat of the fixed carbon will not be taken from coke prepared in the laboratory, nor from the same sample of coal of which the heat of combustion is determined but will be derived as an average from 7 commercial cokes made from coal mined in Kentucky and consumed in a Parr calorimeter.

Had this investigation been kept in view at the time the survey made the tests on Kentucky coals, the goal would have been more certainly attained by actually determining the heat of combustion of the coke from a sample of coal which was a duplicate of the fuel tested in the calorimeter.

AVERAGE ANALYSIS AND HEAT OF COMBUSTION OF 7 COMMERCIAL COKES FROM KENTUCKY COAL

	Highest Value	Lowest Value	Average Value
Moisture	0.77	0.02	0.35
Volatile combustible matter	1.62	0.19	0.89
Fixed carbon	90.61	79.23	84.63
Ash	19.16	9.07	14.13
Total			100.00
Sulphur	2.01	0.45	1.01
B.t.u. per lb. of coke	12,717	10,283	11,703
Total combustible matter (100 − moisture − ash)			85.52
B.t.u. per lb. of same	14,491	12,842	13,684

*Chief chemist, Agricultural Experiment Station, Kentucky State University, Lexington, Ky.

Abstract of paper entitled "Some Calorimeter Determinations of Kentucky Coals," read at the Kentucky Mining Institute, Kentucky State University, Lexington, Ky., May 17, 1913.

From this table it appears that the average heat value of the combustible matter in these samples of coke was 13,680 B.t.u. per pound, and, in the absence of better data, I propose to use this figure in the calculations which are to follow.

Why Coke Burns with Less Heat than Amorphous Carbon

The range of variation in the analysis of these samples and in their heat values as thus determined, is quite large and the figure for the average heat value is considerably lower than that usually accepted for carbon. There are, however, certain reasons why the heating value of the combustible matter in coke should not be as great as that of pure carbon. Coke always contains more or less sulphur as well as small percentages of nitrogen and hydrogen.

Hydrogen, of course, would tend to bring up the value a little, whereas, sulphur and nitrogen would reduce it. Besides this, according to the statements of the textbooks, Favre and Silbermann, whose work was published in 1852, declare that the heat value for graphitic carbon is decidedly lower than that for the amorphous form of that element, and it is probable that a part, at least, of the carbon in coke is graphitic in character. The value, 13,680 B.t.u., therefore, does not seem unreasonably low.

In recent literature there seems to be little which bears upon the subject of this investigation. One chemist, however, seems to have made some careful inquiries along much the same lines, but unfortunately I have the account of his work only in the form of the brief summary which appeared in the Abstract Journal of the American Chemical Society.[1] The work is a thesis by Herman Streit, entitled "Studies on the Chemical Composition and Heat of Combustion of Cokes Prepared by Different Methods, and on the Determination of the Heat of Combustion of Coals by Calculation.[2]

STREIT'S AVERAGES FOR HEAT OF COMBUSTION OF COKE

For oven coke	14,310 B.t.u.
For gas coke	14,400 B.t.u.
For crucible coke made by the American method of analysis	14,580 B.t.u.

These averages are close to the commonly accepted value for carbon and much higher than the one derived above from Kentucky cokes. Indeed they seem too high.

One of the author's conclusions is that, with few exceptions, due to abnormal composition, as high sulphur, the heat of combustion of cokes can be calculated within about 1 per cent. by multiplying the per cent. of combustible matter by the appropriate factor corresponding to these findings. Thus, for an analysis by the American method, the factor would be 145.8. Another conclusion is that the heat of combustion of the total combustible matter of coke obtained by the same method from different coals is the same, but differs if different methods are employed. The author also concludes that the chemical composition and hence the heat of combustion of the combustible matter of a coal depends on the method of coking.

A paper by H. Bunte, entitled "Notes on the Byproducts of the Gas Industry,"[1] an abstract of which was seen in the Journal of the Society of Chemical Industry,[2] contains data of interest in this connection. The author reports the chemical analysis and heat of combustion of 12 gas cokes, mostly German.

LABORATORY DETERMINATION OF 12 GAS COKES

Ultimate analysis combustible part of cokes	
Carbon	94.18 per cent.
Hydrogen	0.90
Oxygen and nitrogen	3.77
Sulphur	1.13
	99.98
Proximate of analysis of original coal	
Total combustible matter	89.11
Water and ash	10.89
	100.00
Actual and theoretical determinations of heat values	
B.t.u. per lb. of total combustible matter, from the calorimeter determinations	14,101
Calculated from the analysis by Dulong's method	14,006

This value, also, is higher than that obtained from the Kentucky cokes, but tends to confirm it because gas cokes are presumably less thoroughly carbonized than are oven cokes and would be expected to have a somewhat higher heat of combustion on account of their containing more hydrocarbons.

Having decided upon a value for the heat of combustion of the combustible matter in coke, we may determine, by difference, what the heat of combustion of the volatile combustible matter in a coal should be, if we have the proximate analysis of the coal and its heating value as determined by the calorimeter.

Allowance Is Made for Water of Constitution in Clay

In order to get the total combustible matter in applying this method, I have decided to subtract not only the ash and moisture but in addition a further 10 per cent. of the ash, which is an allowance made for the combined water contained in the ash constituents before heating.

The ash of coals is composed largely of clay and it is evident that this clay must have contained its proper amount of combined water before the coal was burned. This water would be driven off with the volatile combustible matter and be counted with it in the analysis. Kaolin contains about 13 per cent. of combined water, but as the ash is not all clay I have assumed 10 per cent of the weight of the ash as approximately representing the original amount of water in combination.

Accordingly, in the following calculations, one-tenth of the ash has been, in each case, deducted from the amount of volatile combustible matter shown in the analysis of the coal. The percentage of fixed carbon multiplied by 136.8 gives the heat of combustion of the fixed carbon.* This deducted from the heat of combustion of the original coal gives the heat of combustion of the volatile combustible matter, which, divided by the weight of that matter, corrected as already explained for combined water, gives the heat of combustion per pound of the volatile combustible matter.

These calculations have been made upon the analyses representing coal from five of the important beds of ordinary bituminous coal and also upon a number of cannel coals, as shown in the following tables, which give the data for the calculations and the results. In the last table the final results are brought together and a comparison of them is interesting. As was to be expected, the cannel coals show considerably the highest heat of combustion, both for the total and for the volatile combustible matter.

[1] "Chemical Abstracts," Vol. 2 (1908), p. 1040.
[2] Herman Streit, Dissertation, Univ. Zürich, 1906, p. 115.
[1] J. fur Gasbelencht, 40, 1897, pp. 405-407.
[2] J. Soc. Chem. Ind., xvi (1897), pp. 661-662.

The Volatile Matter of the East Kentucky Field Has More Heat Units Than That of the West

The most important point brought out in this table is that the coals of two important beds, Nos. 9 and 11, in the Western field, agree pretty closely in the heats of combustion of their total combustible matter and of their volatile combustible matter, but differ materially in these respects from the coals of three important beds in eastern Kentucky. It is seen that the heat of combustion of the volatile combustible matter from the Eastern Kentucky coals approximates more nearly that of cannel coal than that of the western Kentucky coals. I believe this observation is a new one and while I do not know that it has any practical application, it seems to me to be worth recording. It would be interesting to extend this study to coals of other important beds, but the time at my disposal did not permit this in the present communication.

In conclusion I desire to thank Mr. J. S. McHargue for assistance in looking up the literature. It is proper also to say that he made nearly all the chemical analyses used in this paper.

CALCULATION OF HEATS OF COMBUSTION OF TOTAL COMBUSTIBLE MATTER AND VOLATILE COMBUSTIBLE MATTER

Coal No. 11. Western Coal Field. Average of 12 samples from Muhlenberg, Union and Webster Counties.

	Highest Value	Lowest Value	Average Value
Moisture	5.87	1.16	4.11
Volatile combustible matter	41.78	37.55	39.67
Fixed carbon	51.11	41.58	47.63
Ash	15.52	5.62	8.59
Total			100.00
Sulphur	4.69	2.64	3.59
B.t.u. per lb. of coal	13,450	10,722	12,833
B.t.u. of 0.4763 fixed carbon @ 13,680 per lb.			6,516
B.t.u. of 0.3967 volatile combustible matter			6,317
B.t.u. per lb. of same after deducting 1/10 of the ash			16,277
Total combustible matter (100 less moisture, ash and 1/10 of the ash)			86.44
B.t.u. per lb. of same $\left(\frac{12,833}{0.8644}\right)$			14,846

Coal No. 9. Western Coal Field. Average of 16 samples from Daviess, Henderson, Hopkins and Webster Counties.

	Highest Value	Lowest Value	Average Value
Moisture	7.32	2.41	4.17
Volatile combustible matter	38.47	34.24	37.19
Fixed carbon	54.34	46.03	49.62
Ash	14.02	5.46	9.02
Total			100.00
Sulphur	4.34	1.96	3.26
B.t.u. per lb. of coal	13,235	11,821	12,730
B.t.u. of 0.4962 fixed carbon @ 13,680 per lb.			6,788
B.t.u. of 0.3719 volatile combustible matter			5,942
B.t.u. per lb. of same after deducting 1/10 of the ash			16,374
Total combustible matter (100 less moisture, ash, and 1/10 the ash)			85.91
B.t.u. per lb. of same $\left(\frac{12,730}{0.8591}\right)$			14,818

Pineville Coal. Eastern Coal Field. Average of 5 samples from Bell County.

	Highest Value	Lowest Value	Average Value
Moisture	2.47	1.13	1.70
Volatile combustible matter	39.03	35.50	36.91
Fixed carbon	61.22	56.85	59.20
Ash	3.16	1.34	2.19
Total			100.00
Sulphur	0.91	0.71	0.79
B.t.u. per lb. of coal	14,952	14,141	14,447
B.t.u. of 0.5920 fixed carbon @ 13,680 per lb			8,099
B.t.u. of 0.3691 volatile combustible matter			6,348
B.t.u. per lb. of same after deducting 1/10 of the ash			17,302
Total combustible matter (100 less moisture, ash and 1/10 the ash)			95.89
B.t.u. of same $\left(\frac{14,447}{0.9589}\right)$			15,066

Upper Elkhorn Coal. Eastern Coal Field. Average of 5 samples from Pike County.

	Highest Value	Lowest Value	Average Value
Moisture	1.70	1.50	1.61
Volatile combustible matter	35.65	32.80	34.51
Fixed carbon	61.80	60.05	60.92
Ash	5.25	1.05	2.96
Total			100.00
Sulphur	0.65	0.61	0.63
B.t.u. per lb. of coal	14,755	13,540	14,205
B.t.u. of 0.6092 fixed carbon @ 13,680 per lb.			8,334
B.t.u. of 0.3451 volatile combustible matter			5,871
B.t.u. per lb. of same after deducting 1/10 of the ash			17,161
Total combustible matter (100 less moisture, ash and 1/10 of the ash)			95.13
B.t.u. per lb. of same $\left(\frac{14,205}{0.9513}\right)$			14,932

Lower Elkhorn Coal. Eastern Coal Field. Average of 5 samples from Floyd and Pike Counties.

	Highest	Lowest	Average
Moisture	2.58	1.67	2.04
Volatile combustible matter	37.15	31.39	34.14
Fixed carbon	64.10	50.87	58.45
Ash	9.40	1.80	5.37
Total			100.00
Sulphur	1.57	0.50	0.82
B.t.u. per lb. of coal	14,835	12,870	13,797
B.t.u. of 0.5845 fixed carbon @ 13,680 per lb.			7,996
B.t.u. of 0.3414 volatile combustible matter			5,801
B.t.u. per lb. of same, after deducting 1/10 of the ash			17,265
Total combustible matter (100 less moisture, ash and 1/10 the ash)			92.06
B.t.u. per lb. of same $\left(\frac{13,797}{0.9206}\right)$			14,987

Cannel Coal. Eastern Coal Field. Average of 10 samples from Bell, Breathitt Johnson, Leslie and Morgan Counties.

	Highest Value	Lowest Value	Average Value
Moisture	2.74	0.68	1.45
Volatile combustible matter	53.09	38.75	46.25
Fixed carbon	53.91	31.72	39.18
Ash	25.62	5.64	13.12
Total			100.00
Sulphur	1.88	0.54	1.16
B.t.u. per lb. of coal	14,244	10,695	13,185
B.t.u. of 0.3918 fixed carbon @ 13,680 per lb.			5,360
B.t.u. of 0.4625 volatile combustible matter			7,825
B.t.u. per lb. of same after deducting 10 per cent. of the ash			17,412
Total combustible matter (100 less moisture, ash and 1/10 the ash)			84.12
B.t.u. per lb. of same $\left(\frac{13,185}{0.8412}\right)$			15,674

TABULATED SUMMARY

	B.t.u. per pound of Total Combustible Matter	B.t.u. per pound of Volatile Combustible Matter
Western Field		
Coal No. 11	14,846	16,277
Coal No. 9	14,818	16,374
Average	14,832	16,326
Eastern Field		
Pineville Coal	15,066	17,302
Upper Elkhorn Coal	14,932	17,161
Lower Elkhorn Coal	14,987	17,265
Average	14,995	17,264
Eastern Field		
Cannel Coal	15,674	17,412

The Kentucky Coal Mining Industry and Workmen's Compensation

An interesting paper with the title given above was read before the Kentucky Mining Institute by K. U. Meguire. We hope to publish the principal part of this article in our next issue.

A European method of disposing of a large gob fire is to first locate the area by testing the temperature of the goaf with metallic rods. The limits of the spontaneous combustion being defined, roads are opened to it through the goaf and the fire or heated material dug out, the space being filled in with sand or flue dust.

Welfare Work at Benham, Kentucky

By W. C. Tucker*

SYNOPSIS—A detailed discussion of the sociological work being carried on by a subsidiary of the International Harvester Co. in its coal mines. The article includes some interesting remarks on Workmen's Compensation Laws, and suggests a basis for the enactment of such legislation.

In building the town of Benham we built neat comfortable houses of two, three, four and five rooms. These houses are on stone foundations, have novelty siding or weather-boarding and are plastered throughout with one coat of wood-fibre plaster. We have found that plaster is more cleanly and sanitary, makes a warmer, cleaner house, and is at the same time cheaper than good ceiling.

There are chimneys with grates in every room except the kitchen, which is provided with a brick flue. The town is cut up into blocks by regularly laid out streets, each house is fenced separately with a neat picket fence in front, and the back yard has either a board or woven wire fence, and there are alleys through center of blocks in rear of lots for convenience in removing refuse, delivering coal, etc.

Water is piped to the back yard of every house from a dam built across a small mountain stream and impounding about one-half million gallons of water suitable for all domestic uses. Electric lights are furnished at the rate of 25c. per room per month, the tenant supplying the lamps after the initial installation. The houses are painted and trimmed in different colors and are of different designs, the idea being to give the appearance of a village where the individual dwellers are owners and have expressed their different ideas in building and painting.

All Yards Must Be Kept Clean

We insist that all tenants keep their yards clean, and we haul away all trash and refuse and furnish lime for the closets, which, by the way, are the ordinary outside type as we have no general sewage system—a vault is dug in the ground, cased with lumber, and the closet set over this and filled around with earth to exclude light and flies.

Under the plan followed by all mines our employees contribute a fixed sum toward a medical fund, which is used to pay our physician a fixed salary and to pay for all drugs; this also provides a visiting nurse, an experienced trained graduate nurse who visits the homes, attends the sick and instructs the mothers in the care of their babies and helps the physician in operations or accidents.

We have three churches, one for the colored population, also one for the catholics, and another for the use of all protestant denominations. The company does not support these churches so far as pastors or visiting preachers are concerned, but does provide the buildings, furnish same, and gives free electric light. The protestant church is supported financially by a league organized for that purpose, and a regular Sunday school is carried on by all the denominations together and is self supporting.

The School System

In order to give our people a full term school we tax our men $1 for families with children of school age, 50c. for those children under school age or none, and 25c. for single men. This charge is monthly and when added to the public funds enables us to have a good school the full term, and we have three teachers and an enrollment of about 140 pupils. In this case we are acting on the idea of enlisting the employees' interest and aid and insuring the attendance of the children through their contributions.

Realizing that amusement is a necessity, it was planned to erect our amusement hall, but through the efforts and solicitations of the State Y. M. C. A. Secretary, this was abandoned and a Y. M. C. A. building erected and equipped at a total cost of about $15,000. This building is steam heated, electrically lighted, and is equipped with tub baths, shower baths, hot and cold water, lavatories, closets, etc. It contains three pool tables, one table for either pool or billiards, a double bowling alley and a moving picture machine. Shows are given three times a week for which a charge is made and on Sunday afternoon a free show of appropriate pictures is given. A handsome soda fountain is in operation, cigars, candies, etc., are sold. A neat barber shop is included in the equipment and is kept busy. The moving picture hall is used for a number of purposes as well as shows.

The Y. M. C. A. Is Self-Supporting

The Company contributes $100 per month to the operation of the Y. M. C. A., but its accounts show that the Association is paying all expenses and a little more, not including the $100 donation, though its object is not to make money, but to afford a place for harmless amusement for our men under the supervision of a regular Y. M. C. A. Secretary and to reduce drinking and rowdyism. This plan certainly adds something to life in isolated places such as most mining camps are.

Now gentlemen, all this is not done for profit. Neither is it done in order that we may say: "I am more righteous than thou," but because the Company takes a personal interest in the welfare of its employees individually and collectively and believes that it is good business policy to get in close touch with the employee, give him comfortable quarters, living wages, and show him that we realize and know he is a human being and not merely a machine performing so many hours' labor.

We intend to build a Y. M. C. A. for our colored population also, and it is hoped that it will have an influence for good among them, and tend to reduce drunkenness, gambling, etc.

We have also planned to build a miners' wash house but have not yet reached the point of actual construction; a small park to be used as a general recreation ground is under consideration. We have now under construction a hotel to be steam heated, electrically lighted

*General superintendent, Wisconsin Steel Co., Benham, Ky.

Note—Abstract of paper read before Kentucky Mining Institute, May 17, 1913.

and equipped with modern comforts in the way of hot and cold water, baths, etc.

Industrial Accident Insurance

The Company has an Industrial Accident Department which provides the payment of one-half wages for not more than two years on account of accident. This plan also provides for three years' wages in case of death from accident and a specific amount for other serious accidents, such as loss of eye, loss of foot, etc.

All the benefits provided by this plan and all expenses of its administration are paid by the Company, except one-half of the disability benefits during the first 30 days, which is paid out of a fund to which the employee contributes the nominal sum of from six to ten cents per month according to his wages.

Since the inauguration of this plan by the International Harvester Company, of which the Wisconsin Steel Company is a constituent part, several states have enacted compensation laws, and in the states of Illinois and Wisconsin, where such laws have been enacted and where the Harvester Company has industrial plants, the Company has filed its acceptance of these laws and is now operating under same.

I think I have said enough of Benham, but in closing I would like to get before this body a statement concerning this workingmen's compensation legislation, which is now attracting so much attention.

Compensation Laws Promote Harmony

The experience of our Company has demonstrated that operation under carefully prepared Compensation Laws has a decided tendency to promote more harmonious relations between the employer and the employee, reduce personal injury litigation to a minimum, and increase efficiency to a noticeable extent, as one indirect effect of compensating for all accidents is an increased effort on the part of employers to reduce accidents. These advantages are, of course, aside from the distress and suffering of the injured employee of the dependants of those who are fatally injured, which are to some extent relieved by the compensation, including necessary medical, surgical and hospital service provided for under Compensation Laws.

The object of so called Workmen's Compensation Laws is to provide adequate and definite compensation to employees who become disabled as a result of accidental injuries received in the course of their employment, also to the dependants of employees who meet with fatal accidents while on duty. The underlying principle for legislation of this kind is that an industry should bear the burden of its industrial accidents in the same way as it bears the burden of fire insurance and replacement of machinery and equipment. This compensation should be provided regardless of who is to blame for the accident, and practically all the compensation laws abolish the usual common law defenses, namely:

1. That the employee assumed the risk of his employment.
2. That the accident was due to the negligence of a fellow servant, or
3. That the accident was due to the contributory negligence of the injured employee.

Prior to this year, fourteen states enacted Workingmen's Compensation Laws, including, Illinois, Michigan, Massachusetts, New Jersey, Ohio and Wisconsin. In addition to these laws, the legislatures of fifteen other states are considering bills providing for similar laws, a number of which have passed both houses. Among these states are Minnesota, Missouri, New York and Pennsylvania.

The Compensation Laws which have stood the tests of the highest courts and in practical operation, include several important provisions, namely:

1. Employers and employees are given the option of electing to accept or reject the provisions of the law; if rejected, the employer is not permitted to plead the common-law defenses.
2. A definite and fair schedule of compensation for certain serious injuries other than death.
3. The creation of an Industrial Commission or Industrial Accident Board to administer the law and to settle all disputes.
4. Payment of compensation to be assured by requiring the employer to furnish evidence of his financial ability to meet the obligations of the law, or on the other hand to require the employer to insure his liability in some mutual or other insurance company authorized to do business in the state .

Favorable Aspect of Such Laws

With a law of this kind you as operators would know that you would have to pay in case of certain accidents, no lawsuits to defend, no liability insurance to carry and at the same time the welfare, or humanitarian idea, if you will, is there just the same because the injured party would get his benefits and in case of death of husband and father the wife and children would get their benefits, without litigation and long delay, but promptly and at the time when it is most needed and will be of greatest benefit; further it will deprive the so called ambulance chaser, both legal and medical, of his job and his parasitic livelihood.

I also wish to call the attention of the operators present to our plan of safety committees. We have a committee of three men on each entry who serve without pay and whose duties are to observe any and all things which may be dangerous, contrary to the rules of the company or the mining laws of the state. These committees are provided with suitable badges and these are worn all the time. Each committee of three men is changed by retiring one man every month and putting in a new man. We feel that in this way we can ultimately interest all our men in preventing accidents.

The Coal Deposits of Holland

A coal seam 6 ft. 3 in. thick has been discovered at the Beringer Veld, near Helden (Limburg), at a depth of 3280 ft. Boring operations are now in progress near Mill and Aploo (Limburg) and in the Zeeland province, and further discoveries are expected shortly.

At present the Dutch coal basin covers an area of 205.8 square miles, including 85.5 square miles in southern Limburg, and 53.2 square miles in the Peel. In addition to this there are 63.9 square miles of coal, which is too deep to be worked. Recent discoveries have been made in the Overyssel province, under an important bed of salt. In the eastern part of this province it is estimated that the coal area, consisting mainly of gas coal, extends over 7.6 square miles.

Thanks to the reduced railway tariffs and to the low rates of freight by the Rhine, German coal practically commands the home market. The total coal consumption by the Dutch industries varies between 10 and 12 million tons annually.

WHO'S WHO—IN COAL MINING

There are few instances in which the careers of ambitious hard-working men of limited means and education stand out as strongly for the uplift of their fellow workers as does that of John Mitchell. The plain unvarnished tale of his forty odd years of life is an inspiration to loyalty and devotion to a noble cause.

John Mitchell was born, of Irish parentage, in Braidwood, Ill., Feb. 4, 1870. He was left an orphan at an early age, and when ten years old went to work on a farm; at thirteen he entered the mines at Braidwood, and from that time until his twenty-sixth year he was employed in the coal mines of Illinois and in those of several of the Western states, which his desire to see something of the world led him to visit. In 1892, Mr. Mitchell returned to Illinois and was married to Miss Catherine O'Rourke, of Spring Valley.

JOHN MITCHELL

As early as 1885, he had joined a Local Assembly of the Knights of Labor, and from that time on his entire sympathies were enlisted in behalf of organized labor. John Mitchell's education, in so far as it can be measured by actual school attendance, was meager; he read with interest, however, many of the standard works on sociological questions, and by study at night endeavored to overcome the handicap which his lack of opportunities produced. He became president of the Local Assembly of the Knights of Labor; and upon the formation, in 1890, of the organization known as the United Mine Workers of America, he identified himself with that body.

Mr. Mitchell was, successively, secretary-treasurer of the Northern Illinois subdistrict of the United Mine Workers of America; member of the legislative committee of the Illinois miners' organization, member of the state executive board of that organization, and finally was appointed national organizer for the United Mine Workers of America. In 1898, he was elected national vice-president, and that same year, upon the resignation of the president of that organization, he was appointed acting president, being later elected to that position, in 1899. He was unanimously reëlected each year until 1908 when, on account of seriously impaired health, he declined to again become a candidate for the office. Mr. Mitchell's first official connection with the American Federation of Labor was in 1898, when he was elected fourth vice-president; he was unanimously reëlected to that position the following year, and in 1900 was elected second vice-president, to which position he has been reëlected each year since that time.

When Mr. Mitchell was made president of the United Mine Workers of America, that organization consisted of 43,000 members; and when he retired from the presidency, it had a membership of more than 300,000 mine workers. Aside from its enormous increase in membership, the achievements of the organization regarded by Mr. Mitchell as of the greatest moment are the great advance secured by joint conference with the coal operators, in 1900, when wages of bituminous-mine workers were increased 21 per cent.; the increase of 24 per cent. in the wages of the anthracite-mine workers, secured as a result of the successful strikes of 1900 and 1902; the establishment of the eight-hour workday in central and western Pennsylvania, Ohio, Indiana, Illinois, Michigan, Iowa, Kentucky, Alabama, Missouri, Kansas, Arkansas, Oklahoma and portions of Tennessee and West Virginia.

At present Mr. Mitchell is a member of various nonlabor organizations for the study of social and industrial conditions and for their betterment, namely, the National Child Labor Committee; the American Academy of Political and Social Science; and the American Association for Labor Legislation. He was a member of the New York Commission on Workmen's Compensation, and is the Trustee representing Labor on the Nobel Peace Prize Fund—the Foundation for the Promotion of Industrial Peace, which Theodore Roosevelt gave to be devoted to the promotion of industrial peace.

In the summer of 1908, Mr. Mitchell was strongly urged to become the democratic candidate for governor of Illinois, as well as to be a candidate on the same ticket for vice-president of the United States. Politics has never attracted Mr. Mitchell, however, and he declined, in both of these instances, to become a candidate. He then moved to New York, and became actively identified with the National Civic Federation, as Chairman of the Trade Agreement Department of that organization. Mr. Mitchell terminated his connection with the National

Civic Federation in March, 1911, because of an unfounded prejudice of the United Mine Workers organization in respect to the work undertaken by the National Civic Federation; thereby proving his great loyalty to the rank and file of the order with which he was still identified. Mr. Mitchell has maintained his membership in the United Mine Workers of America, and has never lost his keen interest in the mining industry, in its affairs, and the men engaged in it, whether as miners, operators or otherwise. For the past two years, Mr. Mitchell has been on the lecture platform; he has spoken in practically all the large cities of the country, and in a large number of the smaller cities, and has addressed many Chautauqua assemblies.

How Best to Handle the Dry or Dusty Mine

By David Victor*

I believe with Frank Haas, consulting engineer of the Consolidation Coal Co., that an explosion may be largely propagated by the gas distilled from the coal in the ribs of the mine during an explosion. Moreover, seeing that it is impossible to get the large quantity of air necessary for combustion in immediate contact with the coal, I feel confident that the explosion is not a true combustion of the coal dust but of the gas distilled from the coal when it is heated.

It is easy to show, without taking any extreme figures, that it is not possible to make a mine free of dry dust by the use of water cars or sprays from water pipes even if these devices are competent to wet dust and not merely create pools of standing water, surrounded by undampened coal powder.

Suppose a mine circulates 100,000 cu.ft. of air per minute and that the intake current shows a dry-bulb temperature of 32 deg. F. and a wet-bulb reading of 29 deg. F.; this shows that the moisture content is only 69 per cent. of capacity. The space occupied by the intake air passing into the mine every minute holds 2.496 gallons.

When the air leaves the mine we will suppose that the wet and dry bulb both read 60 deg. F. This shows that saturation has been reached. The 100,000 cu.ft. of space contains 9.843 gal. of water and the water removed from the mine must be 9.843 — 2.496 = 7.347 gal. per min. = 10,579 gal. per day.

Boilers for Moistening Air

The Consolidation Coal Co. is using exhaust steam from the fan engine and other engines near the drift mouth. Where this is not sufficient, live steam is taken from the boilers, and in a few cases boiler plants are being installed solely to complete the humidification of the air. Every operator should provide each of his foremen with a thermometer, barometer, psychrometer, anemometer and water gage, and see that he understands how to use them.

I believe a charge limit of 2.5 lb. should be fixed for blasting powder and of permissibles no more should be used than will produce a result equal to that of 2.5 lb. of black powder. When the coal is too thick to be broken with the prescribed charge, it should be shot in two benches, the lower bench being shot and loaded out before the holes in upper bench are fired.

All heavy rock shooting or work requiring dynamite should be done when the miners are out of the mine and when only enough men are underground to do work of that kind.

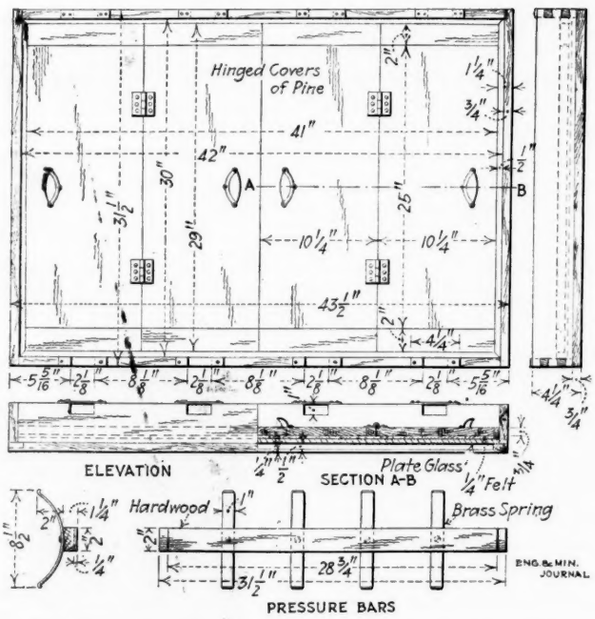
*Chief mine inspector, Consolidation Coal Co., Fairmont, W. Va.

Abstract of paper read at meeting of Kentucky Mining Institute, Kentucky State University, Lexington, Ky., May 16 and 17.

Blueprint Frame

The accompanying illustration is a working drawing of a blueprint frame for prints up to 29x41 in. in size. "This is a standard type of commercial frame," says the *Engineering and Mining Journal*, of May 24, "but circumstances may arise where it becomes necessary or desirable to make such a frame at the mine."

The most important and expensive single item entering into the construction is the plate glass. This is



Working Drawing of Standard Blueprinting Frame

usually of a gage approximating ¼ in., but should be heavier rather than lighter for a frame of this size. The frame proper should preferably be made of hard wood, which should be as thoroughly seasoned as possible. If even a small amount of warping takes place, the glass will be cracked. The same consideration makes it imperative to protect the wood from the absorption of moisture, which is also capable of distorting the frame and breaking the glass.

To avoid accident and save time, it is advisable to have large frames mounted so as to run either on tracks or on a floor and to revolve upon a horizontal axis, and if possible, upon a vertical one, thus obtaining the full value of the sun's light at any time. Such a mounting can usually be constructed out of scrap iron or a good carpenter can make one of wood. A small unmounted frame, similar to the one here illustrated, will, however, be found extremely convenient for handling small tracings.

EDITORIALS

A Generous Public

Sometime ago we read with some surprise that Congress had on the advice of the director of the Bureau of Mines voted Mrs. Cora K. Evans $1320 compensation for the loss of her husband who died performing valiant service for the country in the mines of the Price-Pancoast Coal Co. where, with other members of the Bureau of Mines, he had gone to rescue the unfortunates who were trapped in that mine.

How Congress expects the rescue men of the Bureau to disregard their lives, the happiness of their wives and families and plunge into places of extreme danger with with such a paltry compensation as a reward for heroism in case of death, we cannot tell. Congress and the people are alike niggards when the private purse is concerned, and it is little creditable that the widow had to wait two years for a moiety or less of her just claim.

We are not surprised seeing that the public will not have to pay the bill that the people of Pennsylvania are arranging that wives like Mrs. Evans shall be compensated with $1904 if their husbands die in the coal mines without any of the accompaniments of heroism or that in the state of Washington a compensation of $20 for life has been awarded in a recent act, the limit being placed at $4000.

We do not wonder seeing the subtle distinction between "ours and yours" which the people are making, that the Bureau of Mines which pays compensations of $1320 reckons each life lost as worth $5000. We do indeed somewhat question its estimate of the annual death loss especially in the case of single men.

Most men have so regulated their affairs, that when they die no anticipated gain is lost to the state. They have spent all they made and if they continue to live the outcome will be the same; their consumption and their production will balance so that if they are single the world is hardly the loser when the passing bell is tolled as far, at least, as things of sense are concerned.

We turn with pleasure from the unkind views of the public taken hitherto in this editorial to view the generosity of those same people in gently emptying the pockets of the cruel operator when an accident occurs. We note that the St. Paul Coal Co. of Chicago wound up the last claim against it for $6900. This was not paid without reason. The company knew it was safer to pay Andrino Muzzarelli than to contest the suit. The Cherry mine disaster had already cost that corporation $500,000 for the 256 miners who lost their lives—far more being paid to the wives of men who accepted an ordinary risk than the nation paid to appease the sorrows and remove the want of the widow of a hero who had gone bravely to his duty where death seemed certain.

We would not shame the people by holding up before them a trust—above all the United States Corporation and its subsidiary coal companies. But the temptation is too strong. The wife of a common miner, not a hero, but a woman married to just a plain coal hewer or loader, fresh perhaps from a land where wages are far lower, would get 18 months pay or one half more than Mrs. Cora Evans received and in addition funeral expenses not to exceed $100 from that industrial organization without even filing a claim. The company would not be as good to her as to some others as she had no children and her husband had not worked five years for the trust but still it would be much more liberal than the representatives of the people.

We hope we may escape a charge of *lese majesty* to our soverigns, the electorate, if we point out that John Hays Hammond who is not even a coal magnate or expert gave $250 to Evans' widow as part of the contribution of the Pittsburgh Coal Operators Association which totaled $375.

In conclusion we may be pardoned if in a table we record the compensation to which Mrs. Evans would be entitled under the compensation acts of several of the states assuming, so as to be well within the mark, that the Bureau employees are paid for 52 "weeks" in the year.

COMPENSATION SET BY STATE LAWS

State	Compensation	State	Compensation
Arizona	$4,000	Massachusetts	$3000
California	3,960	Michigan	3000
Indiana under	10,000	Nevada	3000
Kansas not more than	3,600	New Hampshire	3000
Maryland	3,960	New Jersey	1904

Judging by recent legislation, we conclude that while it may be true that corporations have no souls, it seems generally understood that they possess pocketbooks. The people reluctantly and adequately pay their dues to the dead but in righteous indignation they are now determined that the corporations shall not be equally penurious. Of course, they are right; who is it that shall rise and condemn the common people?

❦

Spontaneous Combustion of Coal

A careful investigation shows that in a single recent year, there were 103 cases reported in Lloyd's list of vessels with bunkers on fire, and also 24 cases of vessels with cargoes on fire. The investigators concluded that the occasional spontaneous development of heat is due to chemical changes, which iron pyrites and some carbohydrogen compounds occurring in coal undergo through the agency of atmospheric oxygen.

There is no doubt but that oxidation of pyrites is accompanied by the development of heat, which may increase to such an extent as to lead to the ignition of the coal. It is also a fact that carbon itself, in a finely divided condition, has the property of condensing within its pores large volumes of certain gases, including oxygen. Wood charcoal, for instance, will absorb from the air nine times its volume of oxygen and seven times its volume of nitrogen, which condensation of gas is attended by the development of heat. In such cases, if the heat is allowed

to accumulate, chemical action may be promoted and the carbon be heated to the igniting point.

It is certain, therefore, that the presence of water would diminish the power of coal to absorb oxygen, and, as a consequence, be antagonistic to the oxidation of the carbon of the coal, although it would accelerate the oxidation of the iron pyrites present. Another precaution in the matter of safeguarding stored coal is to have efficient surface ventilation to remove into the open air the gases rising from the coal; however, any attempt to ventilate the bulk of coal by drawing air through it would favor the production of a violently explosive mixture of gas and air.

When coal is being carried on long sea voyages, the temperature in the various portions of the cargo should be tested periodically by a thermometer and registered in the ship's log. In order to guard against an explosion, free and continuous egress to the open air, independently of the hatchways, should be provided for the explosive gases by means of a system of surface ventilation which would be effective in all circumstances of weather.

Some years ago, interested parties conducted an inquiry into a casualty sustained by a sailing ship, through the spontaneous ignition of her cargo of coal and coke. They reported:

1. Artificially dried coal absorbs oxygen with great avidity.
2. Ordinary air-dry coal absorbs oxygen, though less rapidly.
3. Damp coal absorbs oxygen less rapidly, and when piled in heaps does not rise in temperature any faster than dry coal.
4. Thoroughly wet coal is practically protected against the action of the air insofar as the production of spontaneous heating is concerned.

One authority has said that "the heat given off by the oxidation of pyrites is only one-fourth of that evolved by the oxidation of the same weight of coal." Moreover, the oxidation of coal goes on more rapidly than that of pyrites so that it would be expected that the cause of heating in any particular case is the oxidation of the coal rather than that of the pyrites.

It is significant that both Richter and Fayol established the fact that dry coal oxidizes more readily than wet coal, whereas the reverse is the case with pyrites, and yet numerous cases of spontaneous heating occur with dry coal. For all practical purposes, therefore, pyrites is not an agent in the spontaneous heating of coal. In ship's cargoes of large coal the only danger is in the heap of small coal under the hatchways.

The explanation of this is that the rise of temperature in a heap depends upon two factors: The heat must, in the first place, be generated, and in the second, it must not be allowed to escape. Amongst large coal, with much interstitial space, the circulation will be too great to allow of overheating.

If there are any parts of bunkers in which, owing to the proximity of boilers, uptakes, or recesses through which steam pipes, etc., are carried, there is likely to be a higher normal temperature, these parts should, if possible, be stowed with large lump coal and should be worked out as soon as possible. The shoots should be arranged not to deliver small coal into these places. Small coal which accumulates under shoots, etc., should be worked out as soon as possible and not left till the last.

If any coal is left in a bunker when a fresh charge has to be taken in, it should be trimmed into a position to insure its being used on the next voyage. It cannot be too strongly impressed upon those responsible that danger of overheating and spontaneous combustion increases with the length of time the coal remains in a ship.

There is no risk entailed by the coal being wet when put on board. In fact, in cases where coal is known to be of a fiery nature, it is of advantage for the small coal to be dampened when charging the bunkers.

In conclusion, it is well to remember that although some kinds of coal have proved to be more liable to spontaneous heating and combustion than others, it should be realized that all coal, even anthracite, is liable to these occurrences.

❋

The Uninstructed Foreigner

We shall not repeat the time-honored story that the foreigner who now enters our mines is an agricultural laborer and not a miner, and that he cannot be taught by the foreman because he cannot be instructed by the latter in his own language. We leave these banalities of the office and the institute, and ask instead what can be done about it.

Much can be effected we think by the Bureau of Mines. An opportunity is given that organization, it seems, to put the industry still further in its debt for coöperation and assistance. We believe it could engage men who have a good working knowledge of foreign tongues to travel from mine to mine with vitagraphs, stereopticans and models showing how mining work should be performed. Any one who had attended the course could be given a certificate. Such a man would not necessarily be made thereby a miner, but he would be better fitted to be so regarded than a man who had not received such instruction.

Some of these teachers would, of course, talk English, and these could hold day sessions in the schools educating the scholars in the work of safe mining wherever the sons and daughters of miners were to be found.

At the several stations of the bureau, teachers could be kept who would teach elementary mining to all comers. In time, it would probably come about that no man would be allowed by state law to enter the mines without such training and certificates. Moreover, when the compensation law gets fully into operation, the mine owner himself may demand "papers" before admitting the raw product of European farms to the imminent dangers of his mine. It is a wonder that some of the larger companies have not taken that stand already. It would be a hardship to the miner, but its very requirement would make him realize the importance of taking care of his safety.

We are aware that such learning will be condemned as being unequal to that afforded by experience, but to learn by maiming is expensive, and training which results in death is unavailable to the person who suffers it. So it may be conceded that perhaps the inferior training of a school is more to be sought than the rougher education of the mine.

❋

The presence of blackdamp, a mixture of carbon dioxide and nitrogen, will often neutralize the effect of firedamp on a flame. Analyses of mine gas, which gave only a faint cap when tested with a safety lamp, have shown 4 per cent. of methane mixed with blackdamp.

SOCIOLOGICAL DEPARTMENT

Concrete Houses at Lackawanna Mine

SYNOPSIS—The Coal Department of the Delaware, Lackawanna and Western R.R. Co. has constructed twenty double houses of poured concrete for its miners. These houses are perfectly fireproof, the floors, roof and staircases being of concrete. They have 6 rooms and rent at $8 per month.

At Nanticoke, Penn., the Delaware, Lackawanna and Western R.R. Co.'s Coal Department has built twenty concrete double houses by a new and interesting process. It has long been anticipated that before many years, houses would be built by pouring concrete into forms, and perhaps Thomas A. Edison was the first person of record to make this suggestion.

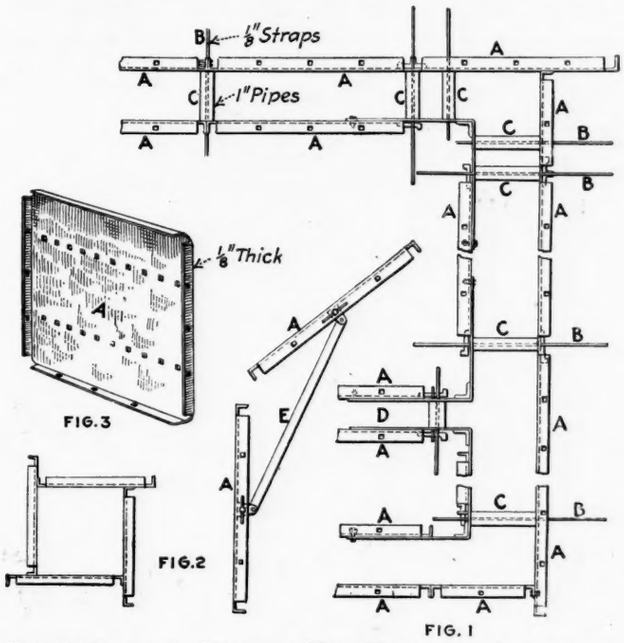
The Edison Plan

That inventor estimated that an equipment of heavy cast-iron molds would be necessary, costing $30,000 for each design. His suggestion could hardly have commended itself to those who are interested in the improvement of dwellings, because a distressing uniformity would inevitably have resulted, and the designs would in many cases have been entirely unsuited for the tenants of the houses thus built. Moreover, so heavy would the molds have been that it is probable that it would not have been possible to have shipped them from place to place economically where only a few buildings were to be constructed.

Contrast this heavy expenditure for molds, the inflexibility of design and the weight of material to be transported, with the simplicity, tightness and portability of the Morrill molds which are illustrated in this article.

Steel-Plate Molds

The plates used are 2 ft. square and are made of ⅛-in. cold-rolled steel, all four edges of these plates being slightly flanged as shown. Two horizontal rows of square holes are punched in each plate, and three square holes are punched in each of the small flanges. These plates are arranged around the building with their flat sides back to back and set at a distance equal to the width of the wall which it is desired to construct.



Figs. 1, 2 and 3. Showing How Parts Are Assembled

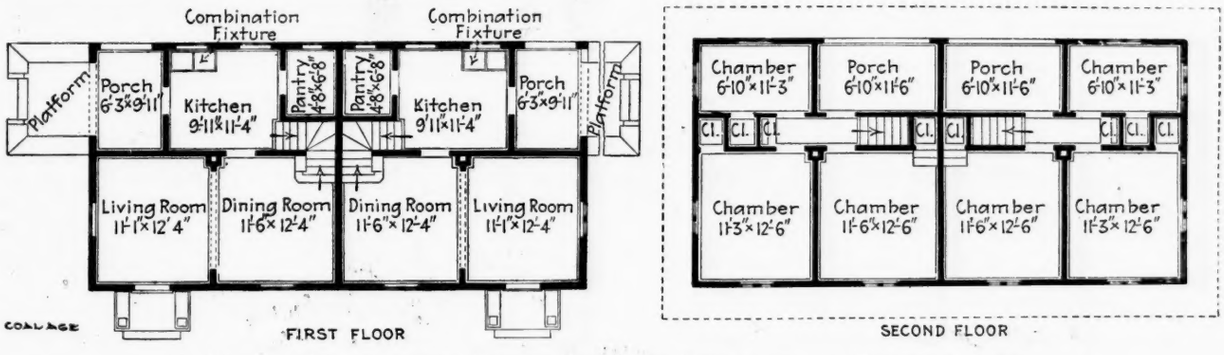


Fig. 4. Plans of the Double Six-Room Dwellings at Concrete City

In order to maintain a uniform width of wall, straps of ⅛-in. cold-rolled steel punctured with square holes are passed through the opposing belts of plates and through a pipe distance piece. The straps are secured in places by wedge pins which are lightly driven into position. Thus the walls are prevented by the pins and straps from becoming too large, and by the pipes provision is made that they are not less than the required width. In Fig. 1 is shown the method of constructing the outside wall of a house. Fig. 2 shows a plan of the forms arranged for a post, and a side view of a plate being lifted from the inferior to the superior belt. Fig. 3

shows a unit plate. The binding strips are marked *B* and the pipes for regulating the width of the wall *C*. The space *D* forms, when filled with concrete, a narrow partition wall.

How the Sizes of the Houses Can Be Varied

It will be seen that it is possible, when turning an angle, to connect the plates to one another at any point desired. Consequently, it is not necessary that the dimensions of the building shall be any even multiple of the width of the plates. For all kinds of houses the same molds will do, the only variation consisting in the variant use of the same plates. As will be seen in the figure which shows the plates in detail, they can be used for the construction of a small concrete post, as well as for molding the lines of the building proper.

Where several houses have to be constructed at one time, it is usual not to use more than two belts of plates around the building. The lower belt serves to protect the concrete which has already been placed, and the upper is used for the molding of the new concrete which is poured in. Where, however, only one house is to be built and consequently a delay of this kind would be expensive, sufficient plates are obtained so that the building can be constructed wholly in one day. Such a building needs to be covered, as shown, with plates from the ground to the roof.

Fig. 5. Plan Adopted Where Rapid Construction Is Desired

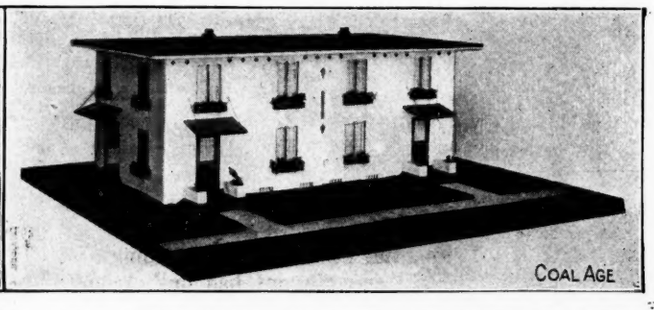


Fig. 6. House Model Showing Cheerful Yet Simple Effect

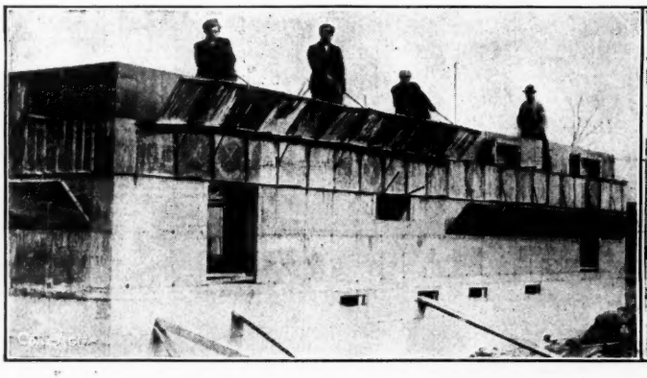


Fig. 7. Raising a Belt. Note Window and Door Frames

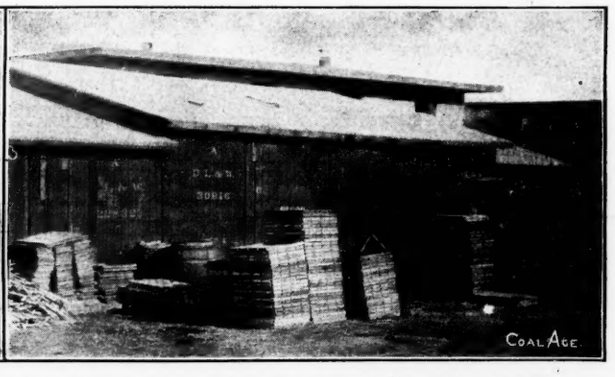


Fig. 8. Piling Frames for Trans-Shipment

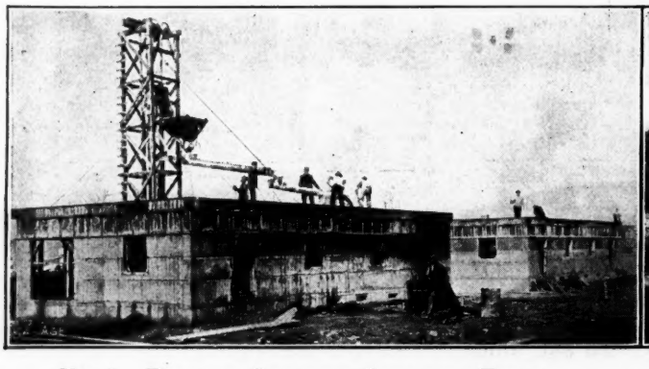


Fig 9. Pouring Concrete Into the Forms

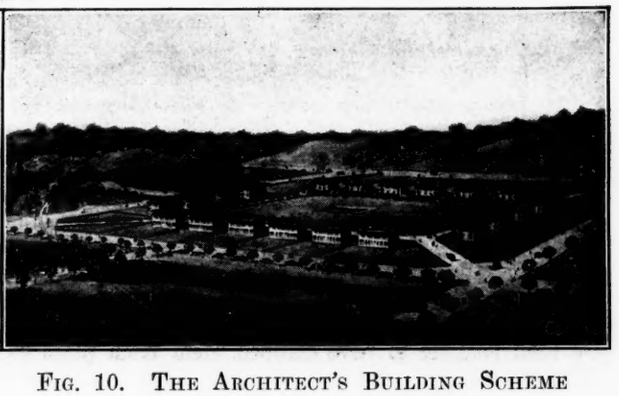


Fig. 10. The Architect's Building Scheme

A most important feature in the method of construction is that the belts of plates which surround the building do not need to be entirely separated by the withdrawing of all connecting wedge pins when it is purposed to raise a belt to a higher elevation. Each series of belts is connected with the belt below it by cross-arms connected to the square perforations in the flanges of the plates.

Thus, as will be seen in one of the illustrations, several

of the plates in a single belt can be lifted with ease at one time. It will be noted that the inner belt in this particular illustration has already been lifted into position, and the outer belt is being placed ready for the pouring of the mixture, which will raise the wall another stage.

The arrangement for openings is extremely simple. As soon as the mixture is at the right level for the casings to be inserted they are placed in position and the filling with concrete continues as before.

Provisions for Warmth and Dryness

In most climates it is not necessary to leave any air space in the wall. It is well, however, to make the concrete as porous as possible. In this way the interstitial spaces serve to make the concrete a good nonconducting material. Such a wall would, however, be extremely damp and cold unless coated with a good coat of paint inside and out. To this end it is the practice of the patentees of this system of building to use two coats of paint, one a primer which will not be affected by the alkali in the cement, and the other coat, one which will improve the appearance of the building.

Resistance to Fire

There are many advantages in connection with these houses. They are entirely incombustible except insofar as the window frames, doors and any moldings which may be inserted are concerned. A fire would not in any way destroy the building, though, of course, as a result, it would be somewhat disfigured by smoke. In fact, in a suburb near Washington, it has been the habit of a concern which is engaged in exploiting a piece of available suburban land, to start a fire in a house of this construction, having previously announced that this experiment would be made and thus gathered a crowd to attest the fire resistance of the structure. Another advantage is that the house is entirely sanitary, and should an undesirable tenant occupy the building, it is extremely easy to clean it out with a water hose when vacated.

Income Derivable

Accustomed as we are to wooden floors in all our dwellings, it is perhaps necessary to point out that some of the finest hotels in New York City have concrete floors in their lobbies, which are covered with rugs.

Fig. 11. Living and Dining Rooms

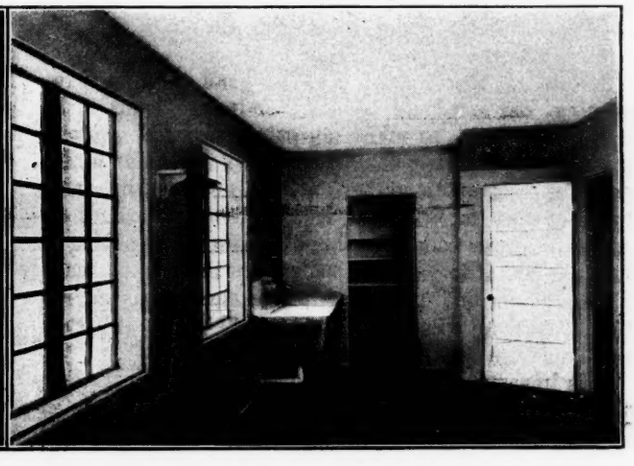


Fig. 12. Kitchen and Pantry

In order to insure further the dryness of the structure, the mixture of cement and cinders is made nonabsorbent by the use of hydraulic lime, the proportions of the ingredients being as follows: One-half part of lime: one part of cement: six or seven parts of cinders. In order to prevent water from rising from the foundations upward into the building, the lowest course is mixed with crude oil.

The Concreting Train

It will be seen that the houses are arranged around a park or playground which measures 300x600 ft. A railroad track was laid around the entire group, and a mixing plant was mounted upon a flat car with an elevator for hoisting concrete attached. Cars of sand, cement and cinders were attached to the mixing car, and the concrete was hoisted from the mixer to an elevated hopper, from which spouts conducted the mixture into steel forms at various parts of the building. As soon as the concrete was placed so as to complete one belt around the building, then the mixing train was moved to the next house and a belt of concrete was placed there.

Each side of the houses which the Delaware, Lackawanna & Western R.R. have built, contains 7 rooms including the pantry, and rents at $8 a month, and we are informed by the company that there is no difficulty in filling these dwellings. The cost of construction has been from $1800 to $2000 for each side of the house.

The profits, therefore, of the investment will probably not exceed 5 per cent. under the most favorable circumstances. It certainly would not pay in direct material dividends to build such houses, if it were not for the fact that they need no repairs and are not subject to fire losses. In order to meet the objections raised to the concrete floors, wooden strips were laid so that carpets could be attached to them. This has removed all difficulties.

It is worth noting that a combination fixture is placed in the kitchen. This serves the duplicate duty of a wash tub and sink.

The introduction of these houses is due to desire of E. E. Loomis, President of the Delaware, Lackawanna and Western R.R., to furnish model buildings for the workers of the coal department. The intention is also

to arrange, not only for uptodate dwellings, but for model surroundings. Much loss of life has occurred from non-fireproof buildings in the mines, but it may be safely said that still more lives are being lost annually by the lack of fireproof buildings. This loss will be entirely removed when the walls, floors, partitions, roofs and stairways of dwellings are constructed of concrete as are those in these buildings.

The patentees of this system of construction are Reed & Morrill, Inc., of 179 Joralemon St., Brooklyn, N. Y. They are providing the molds for several workingmen's dwellings, which are about to be erected near Budapest, Hungary.

We are indebted to them for some of the illustrations to this article but also to C. E. Tobey, Vice-President and General Manager of the D., L. & W. R.R., who kindly had several photographs taken for this issue of COAL AGE. That company has long been most energetic in promoting safety in mines and is about to be equally active in devising new plans for promoting the health and comfort of its employees above ground.

Sincerity and Safety

BY THOMAS MOSES*

Before the motto "Safety First" can have any real meaning, the employer must sincerely and honestly believe in it. If he, as many do, paints it on his property in big signs, places it on his stationery in bright letters, speaks of it in public gatherings, and does nothing more, the words are meaningless, and rather oppose than advance the cause which he should desire to be aiding by their use, but if he sincerely believes in the maxim, makes it his religion, and under no circumstances deviates from its meaning, he will obtain more profit from its preaching than from any other device.

It is important that the employees realize the sincerity of the superintendent in promoting safety. I am informed that only the old men in the industry can recall the times when profits could be made. But when markets are good, and there *is* a profit in the coal business, if you go into your mine and discover some broken bars, loose rock, an accumulation of gas, bad tracks, or any one of the numerous dangers to which a coal mine is heir, it seems a hardship to be obliged to stop operations until the dangerous condition is removed.

THE ADVANTAGES OF THE COMPENSATION LAW

When an accident happens the conditions must be studied with an open mind free from selfish desires. You must find out exactly what caused it, and then make sure that similar conditions are removed from all parts of your mine, if indeed such a provision is possible.

No man can urge safety on his men, if he speeds up the fan or sends special men into the mine to shut doors or to operate his regulators so as the deceive the mine inspector when he makes his visits of inspection. If you would discipline your men, you must first of all discipline yourself. You, yourself, must obey without question the instructions of the mine inspector.

*General superintendent, Bunsen Coal Co., Westville, Ill. Abstract of paper entitled "Safety First from the Standpoint of the Operator," read at a mining conference, State University of Illinois, Urbana, Ill., May 9, at the dedication of the Transportation Building and the Locomotive and Mining Laboratories.

The compensation law is doing a great deal in Illinois to reduce accidents. When the operator knows that he must pay for every accident, he is indisposed to misrepresent the causes of its occurrence in order to make a good defence against liability, and the injured man is equally free from a desire to misrepresent the manner in which he was injured.

THE COST OF SAFETY

It is hard to discover just how much it takes to promote safety in a mine. All the men who are employed to make inspections, serve not only to make the mine safe, but also to make its operation efficient. Good tracks and safe timbering are needed as much to maintain the output of a mine and to save repairs as to protect the miner. Safety and efficiency run so completely hand in hand that it is impossible to classify duties exclusively under either of those heads.

In the nine years previous to the inauguration of "Safety First" as a motto at the mines of the Bunsen Coal Co., there was one fatal accident to every 135,827 tons of coal mined. In the best year of those nine years, there was one fatal accident to every 188,387 tons of coal. During that year very little coal was mined, less than one quarter of the amount now produced.

During the first year of the "Safety First" campaign, one fatal accident occurred to each 132,452 tons of coal mined. During the second year, we had one fatal accident to every 329,474 tons of coal, showing an increase of 192,022 tons of coal mined per fatal accident.

THE "SAFETY FIRST" CAMPAIGN DID NOT INCREASE COSTS

Notwithstanding the fact that an increase of 10.8 per cent. in wages took place during this time, the coal cost less per ton for labor at these mines than it did the year previous to the inauguration of the new slogan. The cost to this company for safety during the period it has been operated under the compensation law of Illinois has been approximately 1½c. per ton, which charge covers all money spent in first-aid instruction to employees, ambulance and hospital service to all who need it, medicine and doctors' services, and the salaries of persons in charge of the compensation department and compensation for all injuries received.

Mine Rescue Work in the State of Washington

BY D. C. BOTTING*

Up to Jan. 1 1911, 46 men had taken helmet training in the state of Washington and received certificates of competency. This number has been considerably increased for we now have 304 men trained as follows: In the use of the helmet only, 64, in both helmet and first-aid work, 146, in first-aid work only, 94. The Bureau of Mines issues no certificates for first aid only but men who take this training are qualified to receive a certificate from the Industrial Branch of the American Red Cross Society.

It is the intention of the Department of Mines to arrange for the organization of Red Cross Societies in as many of the mining towns as possible, during this year and we also hope to have sufficient men trained in both helmet and first-aid work, in every coal-mine town in the State, to enable us at all times to make up a team of at least 6 men who could render efficient service in case of need.

*Chief mine inspector, Seattle, Wash.

DISCUSSION BY READERS

Conditions in the Cincinnati Mine

The recent disaster in the Cincinnati mine calls to mind some recollections in my own experience in the mines in that vicinity, where I worked nearly forty years ago. The mining methods at that time were generally crude; butt entries, in many instances, were driven single and draft facilities (ventilation) were of a low order. Fans were almost an unknown feature of the equipment of the mines located along the west bank of the Monongahela River, and small furnaces and natural draft were almost the sole dependencies for ventilation. There was gas in the mines, but the quantity was small, and the air current, though feeble, was sufficient to dilute the gas below the danger point. Occasionally, explosions occurred, but they were of comparatively little force and mostly local.

With the inauguration of the inspection service in Western Pennsylvania, a general and steady improvement in mining and ventilating methods began; and, apparently, from the mine inspectors' reports, the Cincinnati mine has kept abreast with the progressive movement. The report for 1907 shows 186 men employed in the mine, which is about the same number that was in the mine on the day of the recent explosion. A ventilating fan produced a current of 42,000 cu.ft. of air per minute against a 2-in. water gage. The report states "The ventilation has been improved and is well conducted to the face of the workings." The report adds that the "8-ft. Stine fan driven by a 40-hp motor was installed to be used temporarily, until a shaft could be put down near the face of the workings, when it is the intention of the management to place a more powerful ventilator at the shaft." The report of 1911 shows that these improvements were made, and that the mine at that time was ventilated by an electrically driven Capell fan, which, running at 150 r.p.m., produced 129,000 cu.ft. of air against a 3-in. water gage.

In my opinion, it is worthy of note that under the primitive methods of working and ventilating this mine and the subsequent gradually improved methods no explosions involving great loss of life occurred; but, after the draft facilities had been improved to an unusual extent, producing a greater air volume than ever before in the history of the mine and when the mine appeared to be better and safer in every way, a great disaster has occurred. The situation suggests the question: Did the effects of these commendable and desirable improvements contribute, in any manner, to the occurrence and magnitude of the explosion? I believe they did.

Some time since, experiments were made by T. E. Richards, Aberdare, South Wales, to ascertain what effect, if any, the speed of the ventilating fan had upon the flow of gas from more or less constant feeders in the mine. While the experiment showed that the effect of reducing the speed of the ventilator on a number of such feeders was to almost invariably lower the level of the igniting line of the gas; there were, however, two blowers that acted otherwise, a feature that could not be explained, but was thought to be the result of opposing factors.

In a recent paper on Analysis of Mine Air, Mr. J. W. Hutchinson states that the slowing down or stopping of the fan when exhausting resulted in an increase of pressure throughout the mine; and, as a result, the outflow of gas from the strata was materially checked for a time; and the fan was again started the outflow of gas increased at once, owing to the decrease of pressure caused by the action of the fan.

Now, applying these facts to the ventilation of the Cincinnati mine, the water gage produced by the old fan was 2 in., which the new fan increased to 3 in. The increased depression in the mine favored a larger emission of gas from the strata.

I have repeatedly called attention to the fact that the most disastrous explosions have occurred in mines with ventilating arrangements of a superior order, where large air currents were produced by powerful fans. I believe that explosions of great force and magnitude are of much less frequent occurrence in mines having less facilities for producing draft. In my opinion a review of the conditions and events in the Cincinnati mine during the many years of its existence presents a striking illustration of this fact

I am impressed with the thought that the great improvements made in recent years, in the methods of mine ventilation, have created a danger that could be readily minimized or eliminated entirely, if the existence of such danger were generally appreciated and its nature better understood. I believe the danger is greater because its presence is generally unsuspected, under the improved conditions of ventilation in mines. In order that the commendable work done by mine operators and owners, who have provided more than sufficient means for producing ample and efficient ventilation in mines, may have its due reward and that these efforts to secure greater protection to health, life and property may bring, in the fullest measure, the desired beneficial results, a better understanding of the existing danger and how it may be overcome is necessary.

The alarming frequency of great explosions in well arranged mines where the ventilating facilities are far above the average, and the apparent immunity from such explosions in mines working the same seam of coal under practically identical natural conditions but having greatly inferior ventilating arrangements, in my opinion, cannot be reasonably regarded as a matter of mere chance. There must be a general and fundamental cause to account for their persistent occurrence under conditions generally considered as acting to prevent such occurrences; and it seems decidedly worth while to discover this cause, if possible.

JOHN VERNER.

Chariton, Iowa.

Danger in Rapid Firing

Some time since my attention was drawn to a statement in COAL AGE, referring to the rapid manner in which shotfirers must perform their work. In most cases, these men must fire from 150 to 300 shots a piece. They go into the mine at 3:30 and start firing, often finishing their work by 5 o'clock but seldom later than 6:30 p.m., no matter what the size of the mine may be or the number of shots to be fired. I believe this rapid work is too often the cause of local explosions, which at times result in loss of life.

If shotfirers would take into consideration the dangers to which they are subject, I believe they would, in most cases, change their method of working. Instead of doing this work in 3 or 3½ hr., if shotfirers would allow themselves a longer time, say 5 hr., to do the same work there would be less danger of trouble.

Many explosions have originated in the firing of shots in quick succession, or in the firing of two or more shots in a close working place or heading. The firing of such shots is, in many instances, absolutely unsafe and, rather than perform the work in this manner, shotfirers should make a second trip to such places.

JOHN SUTTON, Fireboss,
Wizard Mine.

West Terre Haute, Ind.

The Geyser at Equality

I note in the editorial of your paper reference to the accident to the mine of the Gallatin Coal company. I once experienced a phenomenon somewhat similar. About 1900 or 1911, No. 1 mine belonging to what was then the James W. Ellsworth & Company, Ellsworth, Penn., took fire and to put it out the mine was flooded. The fire destroyed the tipple and timbering in the shaft.

Mine No. 1 was connected with mine No. 2 by two entries, 1800 ft. in length. The average depth of each shaft was about 275 ft. The water entered at mine No. 2. Above the highest point in the mine, a bore-hole was drilled to act as a vent.

To unwater the two mines, buckets were swung in the No. 2 shaft. After the work of unwatering had been in progress a short time, a stream of water was noticed to shoot up out of the bore-hole driven for a vent. At times it would rise fully fifty feet in the air. This action continued at least two days and then gradually ceased.

My theory is that the borehole acted as a steam ejector. compressed air being the power in place of steam, the air being compressed by the water used to flood the mine. I believe the Equality outburst has a similar cause.

G. M. SHOEMAKER,
General Manager, Virginia-Lee Co., Inc.

St. Charles, Va.

Study Course in Coal Mining

BY J. T. BEARD

The Coal Age Pocket Book

Combining equations (1) and (4), we have

Velocity due to fall through height h, $v = g\sqrt{\frac{2h}{g}} = \sqrt{2gh}$ (5)

Height to produce a given velocity, $h = \frac{v^2}{2g}$ (6)

EXAMPLES TO ILLUSTRATE

1. What is the theoretical velocity that a freely falling body will attain in eight seconds?

Solution—$v = gt = 32.16 \times 8 = 257.28$ ft. per sec.

2. What is the theoretical velocity a freely falling body will attain and what is the time required in falling through a height of 2000 feet?

Solution—The final velocity or the theoretical velocity due to this height is

$$v = \sqrt{2gh} = \sqrt{2 \times 32.16 \times 2000} = \sqrt{128{,}640} = 358.66 \text{ ft. per sec.}$$

The time required for this fall is

$$t = \sqrt{\frac{2h}{g}} = \sqrt{\frac{2 \times 2000}{32.16}} = \sqrt{124.37} = 11.15 \text{ sec}$$

3. What height of fall is required to produce a theoretical velocity of 500 ft. per sec.?

Solution—

$$h = \frac{v^2}{2g} = \frac{500 \times 500}{2 \times 32.16} = 3886.8 \text{ ft.}$$

4. Through what height will a body fall from rest in 30 seconds?

Solution—

$$h = \frac{gt^2}{2} = \frac{32.16 \times 30 \times 30}{2} = 14{,}472 \text{ ft.}$$

Velocity Due to Any Given Height—Since a body falling under the influence of gravity attains a certain velocity and falls through a certain height, in a given time, the velocity attained is said to be due to the height through which the body has fallen. Roughly, the velocity attained by a falling body, disregarding the resistance of the air, is eight times the square root of the height from which the body falls; the body falling from rest, and the height being expressed in feet and the velocity found in feet per second. This relation is expressed by the formula

$$v = 8\sqrt{h}$$

For example, disregarding the resistance of the air, which acts to retard the fall, a leaden bullet dropped from the top of a tower 100 feet in height would strike the ground with a velocity of $8\sqrt{100} = 80$ ft. per sec.

The Coal Age Pocket Book

The following are the values of the force of gravity at sea level, for different latitudes, as determined by experiment and subsequent calculation:

By experiment,	New York,	lat. 40° 30′;	g = 32.160 ft. per sec.
	Paris,	lat. 48° 50′;	g = 32.183 ft. per sec.
	Greenwich,	lat. 51° 29′;	g = 32.191 ft. per sec.
By calculation,	Equator,	lat. 0° 00′;	g = 32.091 ft. per sec.
	Parallel 45,	lat. 45° 00′;	g = 32.173 ft. per sec.
	Poles,	lat. 90° 00′;	g = 32.255 ft. per sec.

For the purposes of general calculation, the value first given above, being the value for New York at sea level and a fairly average value, is commonly used. But where greater accuracy is desired, this value must be corrected for latitude and for elevation above sea level.

Calculation of Gravity—The calculation of the force of gravity for any latitude (L) and any elevation (h) above sea level, is based on the value determined for the 45th parallel; namely, g = 32.173 ft. per sec. The formula used for making this calculation is

$$g = 32.173 - 0.082 \cos 2L - 0.000003\,h$$

Example—Calculate the value of gravity at Mexico City, latitude 19° 26′ N.; elevation 7600 ft. above sea level.

Solution—

$$g = 32.173 - 0.082 \cos 2(19° 26') - 0.000003 \times 7600$$
$$= 32.173 - 0.082 \times 0.7786 - 0.0228 = 32.086 \text{ ft. per sec.}$$

Effect of Change in Gravity On Weight of Bodies—Since the action of gravity on bodies at or near the earth's surface gives to them weight, any change in the force of gravity produces a like change in the weight of bodies. For this reason, a body weighs slightly more in the higher latitudes at sea level than on a lofty mountain near the equator. The difference, however, is very slight, and, in the use of balances, is wholly eliminated, because both the body and the balancing weights are affected alike.

Gravitation of Bodies—All bodies free to move fall, under the influence of gravity, and are then said to "gravitate." The movement is always downward. The force of gravity acts, in this case, to create a certain velocity each second or unit of time. The same increase of velocity is imparted to each particle of mass so that if there is no resistance to the fall, a small body will drop as fast as a large body.

In a vacuum, a feather is found to fall with the same speed as a lead bullet, because there is no air present to resist the fall. Resistance decreases the velocity of fall.

Acceleration Due to Gravity—The gain per second, in the velocity of a falling body, is called the "acceleration due to gravity." It is the velocity imparted to the body by gravity, each second or each unit of time and is estimated in feet per second. In like manner any force acting on a body free to move produces acceleration. A constant force produces a constant acceleration.

INQUIRIES OF GENERAL INTEREST

Calculating Electrical Currents

The power supplied to an electric motor is 35 kw., the pressure, 250 volts; find the current in amperes; also the horsepower of the current. Kindly give the formulas for these calculations.

ELECTRICIAN.

Michel, B. C., Canada.

In electricity, the power, in watts, divided by the pressure of the current, in volts, gives the strength of the current, in amperes. Therefore, since 1 kw. = 1000 watts and 35 kw. = 35,000 watts, the strength of the current is, in this case

$$amperes = \frac{watts}{volts} = \frac{35{,}000}{250} = 140\ amperes$$

Since 746 watts are equivalent to 1 hp., the power of this current is

$$horsepower = \frac{watts}{746} = \frac{35{,}000}{746} = 46.9,\ say,\ 47\ hp.$$

❖

Coal Underlying an Acre

Being interested in lignite coal land in this state, I want to learn the method of calculating the number of tons of coal underlying an acre of land. I have seen, recently, a chart published by COAL AGE, giving the weight of coal underlying an acre of land, for different thicknesses of the seam; but I think this table applies only to hard or anthracite coal and bituminous coal. Can the same table be used for lignite coal?

WILLIAM HENDERSON.

Cameron, Texas.

We reproduce in the figure below, a portion of the chart to which correspondent refers. As explained in

TABLE I - TONS OF COAL UNDER ONE ACRE OF SURFACE
Calculated for a Specific Gravity of 1.50 or 93.7 lb. per cubic foot

INCHES	LONG TONS	ONE FT.	TWO FT.	THREE FT.	FOUR FT.	FIVE FT.	SIX FT.	SEVEN FT.	EIGHT FT.	NINE FT.	TEN FT.
0	0	362.00	3646.00	5468.00	7291.00	9115.00	10938.00	12761.00	14584.00	16407.00	18230.00
1	151.91	1974.91	3797.91	5620.91	7443.91	9266.91	11089.91	12912.91	14735.91	16558.91	18381.91
2	303.82	2126.82	3949.82	5772.82	7595.82	9418.82	11241.82	13064.82	14887.91	16710.82	18533.82
3	455.73	2278.73	4101.73	5924.73	7747.73	9570.73	11393.73	13216.73	15039.73	16862.73	18685.73
4	607.64	2430.64	4253.64	6076.64	7899.64	9722.64	11545.64	13368.64	15191.64	17014.64	18837.64
5	759.55	2582.55	4405.55	6228.55	8051.55	9874.55	11697.55	13520.55	15343.55	17166.55	18989.55
6	911.46	2734.46	4557.46	6380.46	8203.46	10026.46	11849.46	13672.46	15495.46	17318.46	19141.46
7	1063.37	2886.37	4709.37	6532.37	8355.37	10178.37	12001.37	13824.37	15647.37	17470.37	19293.37
8	1215.28	3038.28	4861.28	6684.28	8507.28	10330.28	12153.28	13976.28	15799.28	17622.28	19445.28
9	1367.19	3190.19	5013.19	6836.19	8659.19	10482.19	12305.19	14128.19	15951.19	17774.19	19597.19
10	1519.10	3342.10	5165.10	6988.10	8811.10	10634.10	12457.10	14280.10	16103.10	17926.10	19749.10
11	1671.01	3494.01	5317.01	7140.01	8963.01	10786.01	12609.01	14432.01	16255.01	18078.01	19901.01

The top horizontal column of TABLE I, gives the thickness of coal seam up to ten feet. The extreme left-hand column shows inches. For example: to find the number of tons of coal in a 10-acre tract, where the seam has a thickness of 2 ft. 6 in. run down the 2 ft. column until opposite 6 in. and you will find 455.746 Multiply by 10 and the result is 45,574.60 long tons

To find the weight in long tons for a coal of any specific gravity other than 1.5 it is only necessary to multiply the figures shown in these tables by the ratio of the given specific gravity to 1.50

For Example: The weight of coal underlying a 10-acre tract, when the seam is flat, 2 ft. 6 in. thick, and the specific gravity of the coal 1.30 (Bituminous) is $\frac{1.30}{1.50} \times 45{,}574.6 = 39{,}498$ lg. tons On a pitch of 60 deg. this seam would contain double this amount or practically 79,000 long tons. Expressed in short tons, these amounts should be $\frac{2240}{2000} = 1.12$, or say ⅛ greater.

COAL AGE

CHART SHOWING WEIGHT OF COAL UNDERLYING AN ACRE, FOR A LEVEL SEAM

the note accompanying this chart, the weight of coal is given in long tons, for each inch of thickness of a level seam, from 1 in. to 10 ft. 11 in. in thickness and underlying one acre of surface. The figures on the chart refer to a coal having a specific gravity of 1.5, which is the average specific gravity of anthracite coal.

The figures of this table may be made to apply to coal of any other specific gravity, by dividing the weight given in the table by 1.5 and multiplying that result by the specific gravity of the coal in question. This will give the weight of such coal in long tons per acre for a level seam, and to find the weight in short tons (2000 lb.) it is necessary to multiply by 1.12 or, say add one-eighth fto the weight given in the table.

When the seam has a considerable inclination it is necessary, in order to obtain the quantity of coal underlying an acre on the surface, to divide the weight given in the table for the given thickness of seam, by the cosine of the angle of inclination. For example, a level seam of coal 5 ft. 6 in. thick contains 10,026.46 long tons of coal having a specific gravity of 1.5. If the specific gravity of the lignite coal, in question, is 1.2, the weight in short tons, of this lignite underlying an acre is

$$10{,}026.46\left(\frac{1.2}{1.5} \times \frac{2240}{2000}\right) = 8983.7\ tons$$

If this seam of lignite coal had an inclination of 26 deg. from the horizontal, it would contain

$$\frac{8983.7}{cos\ 26^\circ} = \frac{8983.7}{0.89879} = say\ \ 10{,}000\ tons\ per\ acre$$

When great accuracy is desired, it is always necessary to ascertain the exact average specific gravity of the coal in question, since this varies for different qualities of all grades of coal.

❖

A Suggestive Inquiry

I want to make a suggestion that may help to save lives, and would be glad to see the same discussed in COAL AGE. The question is as follows:

Would there be any benefit derived by connecting the two shafts of a mine (upcast and downcast) by means of a heavy masonry air course built on the surface and provided with iron doors in such a manner that the air current in the fan drift could be conducted to either shaft? It frequently happens that the air shaft with which the fan is connected, is damaged in an explosion and choked with débris to such an extent as to practically incapacitate the fan, although this may not have been injured by the blast. In such a case, would not the proposed arrangement enable the ventilation to be restored in the mine more quickly and expedite the work of rescue?

GEORGE DAVIS

Shenandoah, Penn.

[We give space to this suggestion, which no doubt has some value in its relation to gaseous mines or dusty mines, liable to explosion. We shall be glad to have the question discussed further by practical mining men.

There are many questions similar to this one, asked by correspondents, from time to time, that are deserving of the most careful consideration on the part of mine officials. It often happens that what seems a good scheme is proved by the discussion of practical men to be unsafe. Hence the value of a thorough discussion.—ED.]

EXAMINATION QUESTIONS

Examination for Mine Managers, Mine Examiners and Hoisting Engineers Held at Springfield, Ill., April 14, 1913

(*Selected Questions*)

Ques.—To light a mine with 200 lamps of 16 cp. each, what amount of mechanical energy would have to be available for conversion into electricity?

Ans.—A 16-cp. lamp may be assumed to consume from 50 to 56 watts of energy. Estimating on the maximum amount, the total electrical energy required would be $200 \times 56 = 11{,}200$ watts. The efficiency of the dynamo may be taken as 90 per cent. and, since 1 hp. is equivalent to 746 watts, the power transmitted by the belt running the dynamo is

$$H = \frac{11{,}200}{0.90 \times 746} = 16.68 \; hp.$$

Now, assuming the efficiency of the engine driving the dynamo as 85 per cent., the total indicated horsepower (i.hp.) is

$$i.hp. = \frac{16.68}{0.85} = 19.62, \; say \; 20 \; hp.$$

Ques.—A siphon has its short leg, 10 ft. vertical, and long leg, 20 ft. vertical, and is 6 in. in diameter, with a total length of 100 yd. Find the flow, in gallons per hour, allowing for frictional resistance.

Ans.—It is never safe to calculate the discharge of a siphon without first ascertaining whether this siphon will run dry or, in other words, tend to empty itself, which will always be the case if the flow of water in the short leg, under atmospheric pressure, is less than the discharge in the long leg, under gravity. At sea level, the water column supported by the atmospheric pressure is practically 34 ft.; and, assuming that the short leg, in this case, is 100 ft. long and the long leg, 200 ft. long, while the uniform diameter of the pipe is 6 in., the relative flow in each leg of the siphon, calculated independently, is as follows:

$$\text{Short leg,} \quad \frac{34 - 10}{2.08 \times 6 + 100} = \frac{24}{112.48} = 0.213$$

$$\text{Long leg,} \quad \frac{20 - 10}{2.08 \times 6 + 200} = \frac{10}{212.48} = 0.047$$

There is, therefore, no danger of the siphon running dry, in this case.

The discharge of a 6-in. siphon 300 ft. long, having a rise of 10 ft. and a fall of 20 ft., is calculated thus:

$$G = 6^2 \sqrt{\frac{800 \times 6 \; (20 - 10)}{2.08 \times 6 + 300}} = 36 \sqrt{\frac{48{,}000}{312.48}}$$

$$= 446.18 \; gal. \; per \; min.$$

The discharge of this siphon per hour is, therefore, $60 \times 446.18 = 26{,}770$ gal. per hr. It is important that both ends of the siphon be submerged and that an air trap be provided at the crown or summit to collect the air given up by the water.

Ques.—If water weighs 62.5 lb. per cu.ft., and steam at atmospheric pressure has 1640 times the volume of the water from which it was generated, what weight of steam would be used per hour by a pair of engines, 30-in. cylinders and 5-ft. stroke, making 30 r.p.m. and discharging steam at atmospheric pressure?

Ans.—In general steam practice, the terminal pressure in the cylinder, at the moment of release when the exhaust valve opens, is considerably above the atmospheric pressure, for noncondensing engines, which is the usual type of hoisting engines at mines. For this reason, the only assumption that will make possible an intelligent answer to this question is that the steam in the cylinder expands down to atmospheric presure at the moment of release. Even on this assumption, the calculation would be practically worthless since no allowance is made for condensation and clearances, which always form a very considerable percentage of the total quantity of steam consumed.

However, ignoring these two factors, condensation and clearances, and assuming there are four compressions in the steam in the cylinder previous to cutoff, if the engine cuts off at ¼ stroke, the steam will have expanded down to atmospheric pressure, at the moment of release, very nearly. Under this assumption, the cylinder displacement, in cubic feet per minute, or per hour, will give approximately the volume of steam consumed in that time, measured at atmospheric pressure; and if this is 1640 times the volume of the water from which it is generated, the weight of steam is found by dividing the cylinder displacement, in cubic feet, by 1640 and multiplying that result by 62.5.

In the present case, the area of each 30-in. cylinder is $0.7854 \times 30^2 = 706.86$ sq.in. The piston displacement per stroke for the two cylinders is then $2 \times 5 \times 706.86 \div 144 = 49.09$, say, 50 cu.ft. An engine running at 30 r.p.m. makes 60 strokes per min., which gives for the total piston displacement per hour, in this case, $50 \times 60 \times 60 = 180{,}000$ cu.ft. On the assumed basis, the weight of steam consumed per hour is, then, $180{,}000 \div 1640 \times 62.5 =$ say, 6860 lb.

Ques.—How would you open and close the valves to start and stop an engine, as quickly or as slowly as possible? Give reasons.

Ans.—Steam is compressible, and the effect of the sudden arrest of the flow of steam is not like that when a flow of water is suddenly arrested by the closing of a valve. The sudden opening or closing of the steam valve or throttle will produce no other effect than a possible derangement of the rope connections on the cage or the position of the rope on the sheave or drum, provided the momentum of the cage is such as to produce a slack rope when the winding drum is arrested too suddenly by shutting off the steam and applying the brake. It is important, however, in hoisting, to start the engine slowly, so as to overcome the inertia of the cage gradually and not produce an undue strain on the rope connections and other parts of the winding gear.

COAL AND COKE NEWS

Washington, D. C.

According to information made public by the Department of Justice a modified final decree of the Supreme Court in the Government's case against the Philadelphia & Reading Coal & Iron Co. has been filed in Philadelphia. The so called 65 per cent. contracts made by the defendants severally with other named producers before the court for the purchase of anthracite coal mined or owned by the producers, as set forth in the pleadings and evidence, "from the times they were entered into have restrained and monopolized trade and commerce among states."

The exceptions already referred to were a contract dated Mar. 1, 1902, between the Pennsylvania Coal Co. and the Elk Hill Coal Co.; a contract dated Nov. 1, 1900, between the New York, Susquehanna & Western Coal Co. and John Jermyn and Joseph J. Jermyn; a contract dated Oct. 21, 1903, between the Hillside Coal & Iron Co. and the Lackawanna Coal Co., Ltd.; a contract dated Oct. 26, 1899, between the Lackawanna R.R. and the People's Coal Co., and a contract dated May 1, 1907, between the Lackawanna and the George F. Lee Coal Co.

The so called 65 per cent. contracts, therefore, with the exceptions stated, are canceled by the decree of the court, and the defendants who are or were parties thereto, including their officers, directors or other agents or assignees are "perpetually enjoined and prohibited from further executing them directly or indirectly, and from entering into any like agreements or arrangements restraining or monopolizing interstate commerce in anthracite coal."

The decree of Dec. 20, 1910, is modified, so as to dismiss the petition as to the alleged acquisition and holding by the Erie of a majority of the capital stock of the Susquehanna R.R. This is done, however, without prejudice to the right of the United States to institute any other suit or proceedings.

The same dismissal of petitions, but without prejudice to the United States government, is made in respect to the charge based on the alleged acquisition and holding by the Reading company of a majority of the capital stock of the Central R.R. of New Jersey.

Reduction Ordered in Freight Rates

In a decision handed down on May 23, the Interstate Commerce Commission, upon the complaint of Wayne R. Brown, orders the Boston & Maine, Delaware & Hudson, Lehigh Valley, New York Central, New York, Ontario & Western and West Shore R.R., to reduce the rates on anthracite coal from points in Pennsylvania to Scotia, New York. The roads have been charging $2.15 per ton on prepared sizes, which rate was ordered to be reduced to $2 from Packerton, Peckville and Scranton, Penn., to Scotia, by July 15.

Rates on coal of other sizes were ordered reduced proportionately. In this instance it was found that rates were so arranged as to permit merchants in Schenectady to deliver coal in Scotia. The commission held that both points were in the same traffic area, and that Scotia should be placed upon the same rate basis as Schenectady.

Coal Will Probably Be on Free List

Thus far efforts in the Senate Finance Committee to secure the elimination of the item coal from the free list have entirely failed. Coal men and various others have lately seen members of the committee for the purpose of securing some duty if possible upon the item. There appears, however, to be a strong disposition to avoid the odium which would, it is supposed, come from a restoration of coal to a dutiable status.

The argument has been made that in order to have a good basis for reciprocity negotiations with Canada it would be only fair to arrange matters, so that coal could be used as makeweight in the negotiations. This argument has not had much effect, so far as can be learned, and it now seems probable that the item will remain on the free list throughout the history of the tariff bill not only in the committee itself, but probably also in the later discussion on the floor of the Senate.

WILKES-BARRE, PENN.

Plans for the new office building which the Lehigh Valley Coal Co. several months ago decided to erect, have been completed by D. H. Burnham and Co. of New York, and the contract in all probability will be awarded by June 1. The structure will be six stories in height, and will be built on North River St., north of the Laurel Line tracks. It will be a handsome edifice of white granite and terra cotta, and will probably mark the beginning of a group of modern buildings in the neighborhood of the Luzerne County court house. It is hoped to have the building ready for occupancy by April 1, 1914.

It will be built upon specifications providing absolute safety from fire. The skeleton structure will be of steel, the interior walls of tiling and the floors of concrete. It will be lighted by electricity and heated by steam, both the power and the heat are to be obtained from the Dorrance Colliery, about 3000 feet away. A conduit along the Lehigh Valley Railroad tracks will carry the necessary conductors.

he outside measurement of the structure is 60x125 ft., over 40,000 sq.ft. of floor space being available. The offices will be of varying size, to suit the requirements of over two hundred employees.

The offices of the vice-president and general manager, the mining superintendent, and the mining engineer, will be on the sixth floor. In the basement there will be, in addition to the storage and stationary rooms, a large dressing room with showers, baths, lockers, etc., for such employees of the office whose work takes them into the mines.

The first floor will be occupied by the paymaster's office, the chemist's office and laboratory, the office of the retail coal shipper, the telephone exchange and information booth, and a large room to be used for conference of officials, or if desired, for employees as a reading room. The second floor will contain the two division offices, that of the Wyoming and that of the Lackawanna. The latter is now located at Pittston, but will be moved to Wilkes-Barre when the change is made. The fourth floor will remain unoccupied for some time, being reserved for future needs. The offices on the fifth floor will consist of those of the mechanical and electrical engineers, of the inspector of equipment, of the legal department, and of the real estate department.

PENNSYLVANIA

Anthracite

Wilkes-Barre—The concrete wall constructed last December to seal off a mine fire in the Kidney Vein of the Buttonwood Colliery, was recently broken down and the fire found to have been smothered by the gases generated by combustion. The work of unsealing the fire area was done by Mine Inspector D. T. Davis, of the Ninth Anthracite District, Superintendent Lewis J. Davis, Mine Foreman William Powell, and five firebosses. This fire had burned for several weeks before the plan of bulkheading it was decided upon, and about 300 acres of coal land were in danger. The colliery is now operated by the Lehigh & Wilkes-Barre Coal Co.

Bituminous

Somerset—The big power plant and tipple owned by the Consolidation Coal Co. at Houghton, near Ralphton, have been destroyed by fire.

VIRGINIA

St. Charles—Plans for the extensive development of the Monarch coal mines near St. Charles, Va., have been completed by the Old Virginia Coal Co., which was formed recently at Chattanooga, Tenn. W. F. Hutcheson is at the head of the company. H. B. Bonney, J. R. Barnes, W. W. Mullen and W. B. Miller are other Tennessee mining men who are identified with the new company.

ALABAMA

Montgomery—Chief Mine Inspector C. H. Nesbitt has asked Governor O'Neal to add another man to the present force of mine inspectors. The term of W. R. Ray, district mine inspector at Blocton, expired Apr. 30. It is believed he will be reappointed.

TENNESSEE

Obey City—Work of opening the large coal seam near Obey City, Tenn., has been begun. The operations are being conducted by the Young Coal & Coke Co. This is the most pretentious effort that has ever been made to develop the coal deposits in Overton County. E. C. Young is at the head of the company, and John McDaid has charge of the mine.

KENTUCKY

Louisville—By a recent ruling of the Interstate Commerce Commission the Louisville & Nashville R.R. Co. was given authority to establish rates on coke in carloads from Benham, Ky., at which point the great coking plant of the Wisconsin Steel Co. is located, to various other points the same as rates concurrently in effect from Appalachia, Va.

Shafer—The East Jellico Coal Co., of Shafer, Ky., which was recently in effect deprived of the possession of its mines by a decision of the Kentucky Court of Appeals in favor of the Bennett-Jellico Coal Co., a suit involving the title to the property upon which the mines were located being sent back to the lower court for a new trial, has opened new entries on a part of its property regarding which there is no dispute, and expects to be able to get out coal by June 1 or thereabout.

Elkhorn—The Elkhorn Fuel Co., in accordance with its plan for the acquirement and development of coal lands on a large scale, has recently purchased of the Long Fork Coal Co. several thousand acres of coal property in Letcher County. Development work will begin at once, and it is believed that coal will be shipped within the next 12 months.

McRoberts—A full recovery from the scarcity of labor which resulted from the shutdowns necessitated by the April floods at McRoberts, Ky., is indicated by the report from that point that the Consolidation Coal Co. is getting out an average of about 54 cars a day.

Middlesboro—A meeting of Harlan County operators was held recently at Middlesboro, Ky., for the purpose of taking steps to present to the Louisville & Nashville R.R. Co. the request of the operators in that field for the same rates on coal to all points as are given the Bell County operators. The removal of the 10c. differential as to all points north of the Ohio River was recently announced, but it is reported that the operators have not had like success with reference to points within the State.

OHIO

Columbus—Both Ohio mine inspectors and the Federal Government investigated the cause of the explosion at the Imperial mine at Belle Valley, Noble County, recently. Two inspectors representing the National Government came from Pittsburgh. After a thorough investigation it was announced by John C. Davies, state mine inspector of Ohio, that insufficient ventilation was the cause. This permitted firedamp to accumulate and this was ignited by a spark.

A number of coal operators met at the Neil House in Columbus, May 23, and discussed the antiscreen bill, which is expected to come up at the extraordinary meeting of the Ohio General Assembly, to be convened some time in the winter. The operators will make a determined effort to prevent the passage of the bill and plans are being laid to bring this about. At the last session of the General Assembly the bill was side-tracked by the adoption of the Thomas resolution, providing for a commission to investigate all the conditions surrounding wages for mining coal in Ohio.

Coshocton—Miners employed at the Morgan Run mine in Coshocton County again went out on a strike because of a controversy over the prices to be paid for driving entries. There was a difference between the men and the operator, according to the miners, of 68c. per yard. An effort is being made to settle the trouble.

Lorain—In the presence of over 200 out-of-town operators the new freighter, "Arnold C. Dustin," built at the Lorain yards of the American Ship Building Co., for John Mitchell, of Cleveland, was recently launched. The vessel is 545 ft. long, and will be used in the coal and ore trade.

McArthur—The fire which destroyed the tipple, engine house and plant of the Starr-Hocking Coal Co., at Coonville, Vinton County, Ohio, caused a loss of $100,000. The fire was discovered in the yard office at 7 p.m. in the evening, and every effort made to stop the flames proved fruitless. Charles Hargrav, who controls the mine ownership, announced that the tipple and engine house would be rebuilt at once.

INDIANA

Indianapolis—Attorney-General Honan, of Indiana, has given an option to Frank I. Pearce, state mine inspector, interpreting the law of 1905 to mean that firebosses in Indiana mines are compelled to examine mines for firedamp that are known to contain, or are supposed to contain that gas, but are not required to examine all working places in mines for firedamp.

Miners employed at the Washington-Wheatland mine near Washington, Ind., have returned to work after being out several days, contending that the mineboss did not make careful examination for firedamp, and they feared accidents. They returned to work after the state mine inspector and deputies had made careful investigation.

Petersburg—The S. W. Little Coal Co. officers were surprised, after pumping out the Blackburn mines, three miles north of this city, to find the motors dry and in usual condition. Before deserting the motors during the recent rush of water into the mines, the drivers took them to the highest point in the mines. It is believed the water forced the air in the mines to the top of the slope and so compressed it as to keep the water back from the motors. It was expected the machines would be ruined by long immersion, and the company was glad to escape a loss of several thousand dollars.

Boonville—The Warrick County Coal Co., recently organized, has bought the Polk Patch mine properties in this country from the J. Wooley Coal Co., and will introduce the strip mining process. The properties have a daily output of 1000 tons. The deal carries with it the conveyance of 5000 acres of coal lands east of Boonville. W. H. Hays, L. E. Fischer and R. R. Hammond are the directors. The capital stock of the new company is $350,000, all from Chicago.

ILLINOIS

Marion—A fire, which started about six o'clock on the evening of May 22, at the mine of the Illinois Hocking Washed Coal Co. at Marion, continued until about three o'clock on the afternoon of the following day. Two supply men, who were distributing powder in the mine at the time of the fire, were taken from the mine on the afternoon of the 23d. They were Ed and John Duncan, brothers, 19 and 30 years old, respectively. John was dead when found and Ed was unconscious, was able to tell of his experience the next morning. One mule of the 17 owned by the mine was saved, the other 16 having perished in the fire. The air shaft, the fan and fan house were also destroyed. It is not known how the fire originated, but is supposed to have started in an old tool house, which was being used as a wash room.

Springfield—Fire destroyed the plant of the Royal Collieries Co., at Virden. The loss is estimated at $125,000.

OKLAHOMA

McAlester—After a three months' shutdown the Adamson mine of the Union Coal Mining Co., of McAlester, Okla., has been reopened. Orders from the district tributary to this mine are expected to be heavy enough to keep the property in operation without interruption until February or March. W. E. Beaty is president of the company.

TEXAS

Palestine—Anderson County, Texas, coal deposits are being examined by New York engineers. Prospect holes are being sunk on several of the outcrops and diamond drilling is being done. Considerable secrecy surrounds the operations, but it is understood that Palestine interests have an option on a considerable acreage of coal lands.

Loving—The Sallie-Alice Mining Co. has opened a coal shaft on the W. S. Purselley lease and has installed its machinery. The firm is working night and day shifts to get the entries sufficiently advanced to enable it to begin filling a large contract at an early date. The coal is considered as good as any in the state, being a 5-ft. bed of bituminous found at a depth of 100 ft. under a rock roof and carrying just enough water to keep down the dust.

WYOMING

Lander—The Gebo coal lands, near Hudson, in Fremont County, amounting to 2200 acres, were formally restored to public entry on May 12. These lands are regarded as some of the most valuable in the district and already a number of filings have been made. This tract has been classified by the Government and entrymen will have to pay from $30 to $50 an acre to secure their claims.

MONTANA

Glendive—R. W. Snyder Coal Mine has been purchased by C. J. Bohannon and Geo. B. Williams, the consideration has not been made known. Experts have been employed and after a brief examination they state that the public has no idea of the tremendous amounts of coal in this mine. The Northern Pacific Ry. will build a spur leading to the mine from Stipek, a distance of two miles and will carry 100 tons of coal per day for the first year.

WASHINGTON

Astoria—J. C. Brooks, representing a big coal company, located in the Middle West, was in Astoria last week for the purpose of investigating conditions relative to the establishment there of a big coal dock to provide coal for steamships coming to the Columbia River. Astoria is at the mouth of the river and bunkers there would be in good position to furnish

coal for outbound vessels which, as a rule, now proceed to British Columbia to fill their bunkers for long voyages.

Chehalis—J. E. Leonard has found a vein of coal 250 ft. west of Coal Creek. The height is 8 ft. and the quality is superior to most coals that have been uncovered in the vicinity.

PERSONALS

E. F. Mullin, for many years engineer for the Jeffrey Manufacturing Co., and previously with the Heyl & Patterson Co., has severed his connection with the former concern to join the engineering staff of the Link-Belt Co., Philadelphia.

Mr. Mullin has had extensive experience in the design and construction of tipple equipment and general coal handling machinery, particularly in the West Virginia and Pennsylvania coalfields.

J. F. Healey has resigned his position as general manager of the operating department, Davis Colliery Co., Elkins, W. Va., effective May 31. Mr. Healy is considering several offers of similar positions, but may open a consulting office in Charleston, W. Va.

A. M. Campbell, formerly of Louisa, Ky., and recently engaged in mining and development work in eastern Kentucky, has been made general manager of the Elkhorn Fuel Co.'s operations, and is at present in the Boone's Fork district looking over the ground for the purpose of planning for the beginning of active work.

The announcement is made that W. H. Warner will be in charge of the offices of the Pan-American Coal Co., of Newark, Ohio, which will be moved to the Schultz Building, Columbus, about June 1. The Pan-American Coal Co. recently took over a large number of mining properties in Ohio and West Virginia, making it one of the largest operating concerns in the Buckeye state. W. M. Fulton will be president of the company which will have an authorized capital stock of $500,000.

PUBLICATIONS RECEIVED

Cornell University, Ithaca, N. Y. The Sibley Journal of Engineering; vol. XXVII, No. 8; May, 1913. 30 pp.; 6⅜x9½ in. Annual subscription, $2.50; single copies, 25c.

West Virginia Geological Survey, Coal, Oil, Gas, Limestone and Iron Ore Map. This new edition is the joint publication of the State Geological Survey and the State Semi-Centennial Commission. It contains all the special features of previous editions brought up to date and shows the approximate areas of the several coal series, operating mines and their post-office addresses, as well as the oil and gas pools. Size, 35x44 in. Price, 50c. postpaid.

CONSTRUCTION NEWS

Latrobe, Penn.—Tony Colangelo had been awarded the contract to build 80 ovens for the Marietta company, at its plant, near Wilpen, in the Ligonier Valley.

Youngstown, Ohio—Julian Kennedy is at the head of the Poland Coke Co., which is building a plant of 100 ovens on its 1100-acre coal tract on Dunkard Creek, near the Monongahela River in Greene County, Pennsylvania.

Coshocton, Ohio—William Powers, who operates a mine five miles southeast of Coshocton, is contemplating opening up a new mine near Kimbolton, Guernsey County, on 140 acres which he has under lease.

Athens, Ohio—A force of men is now at work in mine No. 210 on Sugar Creek, making ready to put that shaft in operation as soon as possible. This mine has been idle for the past six years, although in all that time its owners, the Sunday Creek Co., has at all times kept it pumped out.

Bicknell, Ind.—The American Coal & Mining Co., recently organized, has purchased a large acreage of coal land near here, and is preparing to sink two mines. The first vein is 7½ ft. thick. Hal R. McClelland, of Clinton, Ind., is vice-president and manager of the company.

Buffalo, N. Y.—The Cascade Coal & Coke Co., an adjunct of the Rogers-Brown Iron Co., of Buffalo, has awarded the contract for an increase of its coal-mining plant at Sykesville, Penn., which will include two 300-hp. boilers and engines, and which is a practical duplication of the present equipment. The addition is to be finished by July 1.

Moundsville, W. Va.—Contractor R. J. McFadden announces that he will start the work of the new shaft on the Ball property back of Glendale, for the Hitchman Coal Co., to be used in connection with the Glendale mine now in operation.

Ragland, Ala.—The Ragland Coal Co. is preparing to open new mines on their property at Coal City in the near future.

Lexington, Ky.—It is reported that on account of the great increase in coal operations along the lines of the Lexington & Eastern, the Louisville & Nashville R.R., which controls that road, is preparing to spend $1,000,000 in improving the property, cutting down heavy grades, shortening the curves, and the substitution of wooden trestles and bridges with steel work, covering the entire distance of 95 miles between Lexington and Jackson, Ky. These improvements are considered necessary in order to handle the traffic which is expected, heavier engines and longer trains being planned.

Altoona, Penn.—Vast coalfields, containing deposits estimated at 475,000,000 tons situate in northern Blair and Cambria Counties, and traversed by the Altoona Northern R.R., now in a state of construction, will soon be tapped. Expert mining engineers declare that the deposits of the new field are sufficient to keep 10,000 men constantly engaged during the next ten years.

The branch of the New York Central into the Cambria fields and at Frugality, and further construction of ten miles of trackage will be necessary to tap into the Gougherty-Patton field.

NEW INCORPORATIONS

Nashville, Tenn.—The Fern Hill Mining Co., Grundy County; capital stock, $25,000. Incorporators: H. L. Gregg, W. G. Dillon, E. W. Patterson, W. P. Stone and W. E. Robertson.

Cleveland, Ohio—The Tice Coal Co., of Cleveland, Ohio has filed papers with the secretary of state changing its name to the Kirk-Dunn Coal Co. and at the same time increasing its capital stock from $10,000 to $300,000.

Columbus, Ohio—The Stalter & Essex Coal Co. of Columbus, Ohio has been incorporated with a capital stock of $25,000 to mine and deal in coal. The incorporators are Calvin Essex, James R. Stalter, Fred Essex, Robert R. Stalter and Charles Essex.

Huntington, W. Va.—The Sharon Coal & Coke Co., of Newton, Penn.; chief works to be located in Pike County, Kentucky; to engage in the mining of coal and the manufacture of coke; authorized capital stock, $100,000. Incorporators: Z. T. Vinson, W. R. Thompson, T. J. Bryan, E. M. Watts and A. E. Bush, all of Huntington, W. Va.

INDUSTRIAL NEWS

Scranton, Penn.—New mining is to be done by the Scranton Coal Co. in the hill section between Irving Ave. and Nay Aug Park and Vine and Myrtle Sts.

Pittsburgh, Penn.—Charles T. Topping has been appointed agent for the Phœnix boilers and engines in the Pittsburgh district. His office is room 816 Bessemere Building.

Windber, Penn.—M. C. Yoder, Chas. Estep and John Reese have taken over the property of the Salem Coal Co., near Salem, Ohio. The mine is being equipped with modern machinery.

Pottsville, Penn.—The Philadelphia & Reading Coal & Iron Co. will soon place in operation in its Suffolk Colliery an 8-ton electric mining locomotive ordered from the General Electric Co.

Moundsville, W. Va.—A big coal deal was consumated here May 10, when the tract lying in Cameron and Liberty districts, comprising a total of 556 acres, was sold to S. W. Booher for $40,600.

Sullivan, Ind.—The Rood mine, near Farmersburg, has been sold by Receiver J. T. Akin to Ralph Sharp, trustee, for

$2035, which will pay the preferred claims. There is due miners for wages $6000.

Bolivar, Penn.—J. W. Miller, representing the company which recently acquired the coal underlying about a thousand acres south of here, has also purchased the John A. Campbell farm, near West Fairfield.

Birmingham, Ala.—The Alabama Mineral Land Co. announces the purchase of 12,000 acres of coal land situated in Walker County, near Jasper, the county seat. C. C. Huckabee, of the Alabama Mineral Map Co., states that the purchase was made from J. F. Andrews, of New York City.

New Orleans, La.—Contracts have been signed in New Orleans for a year's supply of Alabama coal for the vessels of the United Fruit Co., which ply between Mobile and Central America. The vessels landing cargoes at New Orleans will use Pitsburgh coal.

Columbus, Ohio—Application has been made by the Middleport & Northeastern Ry. Co. before the Ohio Public Utilities Commission for permission to issue secureties for the extension of the railroad line through the southeastern part of Athens County to open a rich coal area.

Tamaqua, Penn.—Baird Snyder, of Pottsville, former head of the Lehigh Coal & Navigation Co., is to be president of the corporation that will reopen Silver Brook in a few months. C. M. Dodson Coal Co. is to back Mr. Snyder, and will own a good part of the stock of the new concern.

Pottsville, Penn.—New York City capitalists, who have organized the Bloomingdale Valley Coal Co. have just bought the individual coal operation known as the Phillips Colliery, in the southern part of Middleport, in the Schuylkill Valley. The new owners will develop it to its fullest capacity.

Welch, W. Va.—Jairus Collins, of Bramwell, has purchased the holdings of the Kimbal-Pocahontas Coal Co., for the sum of $35,000. The property is unimproved. At this time we have been unalbe to learn whether Mr. Collins bought the property for the Pocahontas Consolidated Co. or not, although it is supposed he did.

Washington, Penn.—Several coal tracts in the neighborhood of Old Concord, Morris Township, and East Finley Township, have been optioned at a uniform consideration of $200 per acre. Persons taking the options represent that they are agents of Waynesburg people, who are able to finance the deals should they decide to accept the coal.

Birmingham, Ala.—The interests of P. B. Thomas in the Montevallo Mining Co. were acquired May 19 by Henry L. Badham and W. S. Lovell, following the purchase of the Thomas stock by two well known industrial men. Robert J. Badham was elected vice-president, and D. A. Thomas, a son of the retiring president, was elected secretary.

Fostoria, Ohio—The Seneca Coal Co. has brought suit against the Ohio Coal & Coke Co., of Cleveland in the courts at New Philadelphia, Ohio, claiming that a contract for the purchase of certain coal lands in Warwick and Mill Townships in Tuscarawas County has not been carried out. The plaintiff asks for immediate possession of the property.

Wilkes-Barre, Penn.—The Delaware & Hudson Co., will place in operation a new 300-kw. motor-generator set and switchboard in its Baltimore Tunnel Mine. This company will also install a motor-generator set with switchboard of the same capacity in its Pine Ridge Mine at Parsons, Penn. Both machines and apparatus will be furnished by the General Electric Co.

Uniontown, Penn.—A large coal deal involving more than $150,000 and conveying 757 acres of Gilmore Township coal from the Enterprise Realty Co. to Judge R. E. Umbel, Hon. B. F. Sterling, et al, is about to be consummated. The deal was engineered by Kobert & Bradley, J. H. Zimmerman, representing the Realty company and Carter Bros., representing the purchasers of the property.

Chicago, Ill.—The Cleveland, Cincinnati, Chicago & St. Louis Ry. (Big Four Route), through their chief engineer, G. P. Smith, awarded a contract to the Roberts and Schaefer Co. this week, for five large Holmen coaling plants to be built immediately at Paris, Ill., Lynn, Ind., Anderson, Ind., Lilly, Ill., and Dayton, Ohio. This company has also secured a contract for two large 400 ton capacity, reinforced concrete, fireproof Holmen coaling plants which are to be built immediately at Chicago.

Columbus, Ohio—Columbus will be the headquarters of a new coal company, which is expected eventually to rank in size with the Sunday Creek Co. and the Lorain Coal & Dock Co. The new organization is being formed by the merger of the Pan-American Coal Co., the Granger Coal Co. and the Buckeye Coal Co., of Murray County, the Sedalia company, of Jacksonville, Athens County, and others. The new company will control 12,000 acres, employ over 900 men, and have a daily capacity in the start of 8000 tons.

Tiffin, Ohio—The Seneca Coal Co., a company composed of local capitalists, organized a number of years ago to operate coal mines and leases in Tuscarawas County, has brought suit in New Philadelphia, claiming that the Ohio Coal & Coke Co., of Cleveland, has failed to carry out its contract to purchase the property, which is located principally in Warwick and Mill townships, Tuscarawas County, for $50,000. The terms of the sale were $6000 down and $2000 the first of each month until the balance was paid. The Seneca company claims that $35,000 is still unpaid.

Washington, Penn.—During the past two weeks coal tracts in the neighborhood of Old Concord, Morris Township and East Finley Township have been optioned at $200 an acre. The options are being taken by parties who claim to be acting as agents of Waynesburg interests. More than a dozen bore holes are being drilled at various points in the tract known as the Dawson block and should the coal seams prove to be of uniform thickness and the coal of good quality it is believed the options will be taken up. The Dawson block extends over a large portion of Morris and East Finley Townships, a portion reaching across the line in Morris Township. This tract surrounds most of those recently optioned and it is announced that should the Dawson block which is optioned at $240 an acre be accepted the smaller tracts will be sold at the consideration previously named of $200 an acre.

Columbus, Ohio—The international officers of the United Mine Workers of America have given a decision on the strike of the Hisylvania Coal Co. at the Trimble mine at Glouster, Ohio. The men after being out for four months went back Apr. 22 pending an adjustment of the trouble. The original cause of the strike was the discharge of three men, for failing to set posts while driving entries. After an investigation by a representative of the international officers of the organization, during which evidence from the company was admitted tending to show that the posts were on the ground and had been buried by the men, the three men were reinstated at their old positions. Both the men and the company were held equally guilty in violating the state laws relative to safety. J. W. Blower, general manager of the company is trying to have the case re-opened in order to show that the company was blameless in the matter.

Butler, Penn.—W. S. Wagner who has been in the cement business for several years past but who formerly had worked a quarter of a century as a coal miner recently purchased the coal rights on the Redick farm in the Bonnie Brook district. He has recently completed his explorations for coal in that vicinity and has taken up options for the coal rights on several farms adjoining. One of the seams found is 3 ft. 2 in. thick and is pronounced the best coal that has been discovered in this country for some years past. Chemists who have examined the coal declare that it is entirely free from sulphur and superior to the Pittsburgh coal which is extensively used in the Butler district. The old mine taken over by Mr. Wagner is being rapidly developed the new workings having been already extended several hundred feet. There is a nice grade on the roadways that favors the movement of the loaded cars. This is a rare occurrence in mines in this section. It is stated that arrangements have been made and work will be commenced at an early date by the Rochester company for the building of a switch from their main line to the mouth of the mine, a distance of about 500 feet.

Galveston, Tex.—It is confidently expected that this city will be the Texas gateway to South America for both Atlantic and Pacific ports when the Panama Canal is opened for traffic. The outlook is promising for the establishment here of many new lines of business. Inquiries are being received daily and merchants and manufacturers are visiting the city with a view to securing locations. One of the latest evidences in this line concerns coal interests operating in Illinois, Arkansas, Kansas, Oklahoma, Missouri and Colorado. S. W. Sorat, president of the Star Coal Co., and E. R. Dusky, general sales agent for that concern, have been recently looking over the ground relative to the establishment of a mammoth marine coaling station. It is thought to make Galveston a base for supplying bunker coal to ships of all nations. With favorable freight rates the way will be clear for bringing additional industries into the entire Trans-Mississippi territory through the port of Galveston.

The daily production of the mines operated by the Star Coal Co. is 110,400 tons. This company can bring coal to Galveston to supply every ship that floats in the Gulf of Mexico, engaging in the coastwise and foreign commerce.

COAL TRADE REVIEWS

GENERAL REVIEW

The month of May has closed with the hard-coal business in a fairly satisfactory condition. Shipments are coming forward slowly, but small dealers have a liberal supply and a normal amount of orders are on hand for June. The main demand continues to center on stove, egg and nut being comparatively easy and some of the steam sizes now going into storage.

The strong tone still continues in the Eastern coastwise bituminous market, with buyers unusually anxious for tonnage, even at the new high level established for this year; prospects are excellent for a profitable season. All Hampton Roads coal not required in the coastwise trade is being readily absorbed in the export business and on Government colliers. Shipments, all-rail, are barely up to requirements and mining is much below capacity in some districts. Many of the large agencies are declining further orders except when same are from old customers, and the increased buoyancy in the market is being felt even on the lower grades.

New business in the Pittsburgh district is light, but that being done is invariably at an advance on the season circular. The market undoubtedly occupies a strong position with the producers in full control of prices, and will in all probability continue so as long as present conditions prevail. But should the car and labor shortage be relieved, the increased production would probably bring about a rapid reversal in conditions as noted in these columns last week. Indications are, however, that the situation will continue indefinitely, or, at any rate, until the winter trade opens up. The railroads are moving heavy tonnages with good dispatch, but it is becoming apparent that they are up to about full capacity.

Railroad equipment is also becoming scarcer in Ohio, and it is believed that the customary fall car shortage will develop much earlier than usual this season. The Lake trade continues the main feature in the local market, while steam coal is also active and some stir is evident in domestic, although dealers are not as yet beginning to stock. The tonnage handled at Hampton Roads fell below that of the previous week, but was, nevertheless, heavy. There is a strong demand in the spot market, but producers are inclined to hold any surplus tonnages for the purpose of applying these on contracts which soon become effective. Alarm is still felt over the car situation in the Southern markets and fears are expressed that this will not be cleared up before the usual fall shortage develops.

The situation in the Middle Western market remains unchanged, with prices at a low level and likely to continue so. There was, however, some slight stiffening on the steam grades, due probably to the advance in Eastern coals. In the Rocky Mountain region there are rumors that some of the oil-burning railroads and manufacturing industries will again resume coal burning. No authentic information is available regarding this point, but the effect on the coal business there, would be quite material.

BOSTON, MASS.

Bituminous—There is almost no news beyond the general firmness reported last week. Some of the large buyers are engaged in a still hunt for some shipper with a volume of Pocahontas and New River to sell, even at the $2.85 price, but by far the most of the agencies are out of the market, at least for the time being. What coal at Hampton Roads is not being moved coastwise is readily absorbed for export or by government colliers. The tone is strong and the prospect excellent for the whole season.

For Georges Creek and the better grades from Pennsylvania there is steady request and no accumulation is heard. Practically every anthracite cargo from Philadelphia includes at least a bin-load of bituminous. Stocks at this end are small rather than large. All-rail supplies are barely keeping up to requirements. Mining is less than normal for most of the districts and operations in most cases are becoming infrequent. The loading continues slow and with vessels arriving here already on the point of demurrage there is small encouragement for dividing up cargoes.

Water Freights share the generally firm tone of coal prices; 75c. is the prevailing figure on large vessels, Hampton Roads to Boston, with 5@10c. advance on smaller tonnage.

Anthracite is coming forward very slowly, and with many restrictions on the proportion of sizes. There is practically nothing being shipped to the storage depots in New England and dealers are most urgent in their calls for coal. The smaller retailers have had a liberal proportion of their season's supply in April and May, but large distributors in the cities are still anxious over their smal receipts. To still others it is embarrassing not to be able to take the apportionment of egg and nut they are asked to absorb in order to get stove. All told, however, there is a reasonably good amount of anthracite business in hand for June.

Current bituminous quotations are about as follows:

	Clearfields	Cambrias Somersets	Georges Creek	Pocahontas New River
Mines*	$1.05@1.40	$1.25@1.50	$1.67@1.77	
Philadelphia*	2.30@2.65	2.50@2.75	2.92@3.02	
New York*	2.60@2.95	2.80@3.00	3.22@3.32	
Baltimore*			2.85@2.95	
Hampton Roads*				$2.85
rovidence†				$3.73@3.78
oston†				3.78@3.90

*F.o.b. †On cars.

NEW YORK

Bituminous—Local conditions in the bituminous trade continue about the same as the previous week. No further recessions in prices have occurred except in few instances where demurrage coal, particularly in the cheaper grades, were offered at $2.45 and $2.50. The market prices on various grades were as follows: West Virginia steam, $2.50@2.60; fair grades, Pennsylvania, $2.65@2.70; good grades of Pennsylvanias, $2.75@2.80; best Miller, Pennsylvania, $3@3.10; Georges Creek, $3.25@3.30.

Contract tonnage still continues in demand, although the majority of large consumers have already arranged for their yearly requirements. The present situation from all ponits of view indicate a fairly healthy condition, which is probably accounted for by the limited car supply and shortage of labor in some of the Pennsylvania and West Virginia fields. Operators, on the other hand, avoid sending surplus tonnage to tidewater in fear of a repetition of past occurrences when they received ruinous prices for their product. The general trade opinion, notwithstanding the anxiety experienced by certain manufacturers over the tariff question, seems to indicate a decided expectation among operators that there is going to be a lively and active fall and winter season.

Anthracite—From all indications the hard-coal trade is in splendid shape, especially on prepared sizes. The demand for egg and stove coal has created a shortage with most of the operators on these particular sizes, and nut, which up to this writing was hard to dispose of, is beginning to move more rapidly. Local dealers are busy delivering their spring orders, but most of them express a certainty that summer conditions this year will not be different from previous years.

Heavy shipments are being forwarded to the Lakes and Western markets. The individuals are finding difficulty in disposing of pea coal with their line trade, which accounts for the cut price on this size at tidewater. Buckwheat still continues to be a drug and hard to dispose of, in many instances it is offered by the individuals at low prices. Barley and rice coal in the better grades are decidedly short, due, no doubt, to the heavy contract demand on this quality, but the Schuylkill grades of rice size are beginning to get long, although no real difficulty is experienced in making dispositions where a slight cut in price is offered. The Schuylkill grades of barley are not as freely offered as in the past month, but what tonnages happen to be available are still offered at cut prices.

The following is the local market on hard coal:

	Circular	Individual	
		Lehigh	Scranton
Broken	$4.60	$4.45@4.55	$4.50@4.60
Egg	4.85	4.70@4.80	4.85
Stove	4.85	4.80	4.85
Chestnut	5.10	4.95@5.05	5.00@5.10
Pea	3.50	3.20@3.45	3.25@3.50
Buckwheat	2.75	2.15@2.45	2.50@2.75
Rice	2.25	1.85@1.95	1.75@2.25
Barley	1.75	1.40@1.70	

PHILADELPHIA, PENN.

The month of May closes with the anthracite trade in a comparatively satisfactory condition. Most of the large companies will have considerable business go over into the month

of June at the advance of 10c. per ton; they claim that the prospects look as favorable as May, when the mines were worked to their full capacity, and little or no coal went into stock, outside of the small or steam sizes. Broken, egg, stove and nut are still holding their own, as far as demand is concerned. There has been a trifle less demand for pea, which is essentially a domestic size in this market, while buckwheat and rice show little or no improvement. A large proportion of the three last sizes are going into stock.

The retail business is fairly good, although still in the hand-to-mouth state as far as orders are concerned. The demand here is in marked contrast to some of the large Eastern cities. Prompt shipments are demanded, the claim being made that coal is going out faster than received, which seems to be an indication that the lesson learned last fall and winter has had its effect. In this market, the experience of last year has had exactly the opposite effect. It is almost safe to say that the business now being done by the retailers is the same that they have been doing from year to year in the early spring months. There is comparatively little new business from householders anticipating a possible shortage in the fall and winter, and the consequence is, that there is no particular snap or activity to the trade. Most of the dealer's solicitations are along the lines of trying to prevail upon the consumers to take advantage of the present, when coal is comparatively easy, but the results are not as satisfactory as they would like. They will all wait until the last moment, and then it will be again the same committees, investigations, etc., that characterized the business during the last year.

The bituminous market still remains about the same as last reported.

PITTSBURGH, PENN.

Bituminous—While new transactions are relatively light, the major portion of current sales seems to be at an advance of 5c. over the regular season prices, with some large operators refusing to sell except at a 10c. advance. There has been a moderate amount of lake coal sold to the smaller shippers at $1.47½, or a 5c. advance. As noted before, the local coal market appears to be very strong, but there is question how much allowance must be made for the definite policy of many operators not to sell up to the full productive limit except at an advance. The labor and car supply will determine how close to capacity the mines will be able to operate, and these factors are largely indeterminate at this time. With the supply scant the present market position can easily be held, but a fairly full supply of cars and labor might put more pressure upon sellers than is now in evidence. We quote regular season prices as follows, subject to frequent premiums, particularly for ¾-in.: Slack, 90c.; nut and slack, $1.05; nut, $1.25; mine-run, $1.30; ¾-in., $1.42½; 1¼-in., $1.52½, per ton at mine, Pittsburgh district.

Connellsville Coke—The market continues relatively inactive, but with still greater evidence of underlying strength. With a limited demand for prompt furnace, the market has been held at close to the asking price, $2.25, of several weeks, indicating that operators as a whole are closely regulating their output to contract requirements. Foundry coke has sold quite well on contract, being more active than for some time, and $3 does not seem to have been shaded in any instance, sales at slightly under this figure being only of odd prompt lots. While details are lacking, it is understood that the Pittsburgh Steel Co. has closed for at least the major portion of its requirements against the two blast furnaces it is completing at Monessen, the first to be blown in about the end of June and the second about the end of July, shipments to start about a fortnight earlier. It is assumed that the contract was placed at a concession from the usual asking price of $2.50, which price the furnaces thus far have shown no inclination to pay. We quote: Prompt furnace, $2.15@2.25; contract furnace (nominal asking) $2.50; prompt foundry, $2.85@3.25; contract foundry, $3@3.25, per ton at ovens.

BALTIMORE, MD.

There is every indication that the local trade has entered into a period of activity which will continue indefinitely. The demand is becoming more insistent, with the result that prices are stiffening, and many companies are finding it necessary to refuse further orders, except to oldest customers. Spot coals in the line trade are particularly strong, especially the better grades, while the off qualities are bringing higher average prices than for some time past. Coal which has been selling at 70c. per ton has now advanced to 80c., and tonnages are scarce even at this new high level.

The labor situation is one of the principal features in the market at the present time. The scarcity of miners has caused the general impression that the market may advance rapidly until even the high level prevailing during the strike in Great Britain is reached. Many large consumers who have kept out of the market are now buying readily for stocking-up purposes, and indications are that they will continue doing so until substantial surpluses have been accumulated. Operators seem to be in good cheer and say they expect a very satisfactory year. They are busy now making or renewing contracts for steam grades.

The unusually cool weather has had a tendency to create some activity in anthracite, although not of any great extent. Coke operators claim that production has been restricted recently, and is now just about equal to the demand, with no surplus in the market.

BUFFALO, N. Y.

There is all of the former firmness in the bituminous trade and operators are expecting to maintain this position through the season. All the reasons for a continuation of the demand are still in full force and the output cannot well be increased under present conditions. The chief efforts are directed toward increasing production, but that is difficult to accomplish and about the best possible now is to make sure it does not fall off. In some districts there is a growing scarcity of cars which is decreasing the tonnage of the mines. The scarcity of men is also becoming more acute; it extends into all branches of the trade. Anthracite shippers find country jobbers and retailers complaining that they cannot unload their consignments, for it appears that men are harder to get in small towns than anywhere else.

The only weak spot is still coke, which is none too strong at $4.75 for best Connellsville foundry. Quotations of bituminous coal continue on the basis of $2.80 for Pittsburgh lump, $2.65 for three quarter, $2.55 for mine-run and $2.15 for slack, with Allegheny Valley about 25c. less. It is often hard to get Pittsburgh coal at all, as so much of it is tied up in contracts and the lake trade. There is no coal on track unsold and it looks as if the utmost service is being obtained of the cars where the roads are moving them with good dispatch. Consumers are buying promptly and not haggling about the price if they know the quality of the coal. Control of prices seems to have gone entirely over to the seller.

It is now believed that conditions are such in the bituminous trade that nothing short of a general break-down or other business can injure it very much. While iron is not at its best the crop situation is so good that it will counteract almost any bad feature. If labor difficulties fail of an early settlement they will reduce the demand for coal, but they ought to subside before long. The demand for anthracite is still light, with not much promise of early improvement. Lake shipments for the week were 147,000 tons.

HAMPTON ROADS, VA.

While the dumping at tidewater has not been so heavy the past week as the previous one at the same time there has been a good supply of vessels and all piers have been working constantly. Some few of the suppliers are short of coal which has held up a number of vessels a few days but the beginning of next week should see these all loaded and away. There has been a heavy demand for spot coal during the entire week, a number of inquiries coming from the foreign buyers but few sales have been made owing to the fact that suppliers having coal on hand are holding same for contract tonnage about due.

On account of the unrest in the New River field suppliers from that district are making few contracts prefering to hold off until matters are more settled.

Prices offered by buyers have ranged from $2.80 to $2.85 for June cargoes but the latter figure has been refused by the operators as it is expected quotations will go higher during the coming week. Prices for high volatile coals have been quoted from $2.40 to $2.50 but only one or two small sales have been made, there being little inquiry for this grade.

COLUMBUS, OHIO

Despite a growing car shortage which is affecting a number of mining districts in Ohio, the trade has been fairly active during the past week. Reports from Eastern Ohio show a scarcity of cars and this is having an effect on the production from that region. There is also some car shortage reported from other mining districts in the state. Coal men are predicting an acute shortage later on and it is believed it will develope earlier than last year.

The lake trade is active in every way and the demand from the Northwest is strong. Dock prices are 10c. higher than last year and that fact is stimulating the trade. The congestion caused by the ice and scarcity of unloading machines in the upper lake ports is passing away. Toledo docks of the Hocking Valley company loaded 113,000 tons for the week ending May 23 and since the opening of navigation the docks have handled 504,000 tons. Another strong point in the market is the demand for steam tonnage. Factories engaged in making iron and steel products are busy and their fuel

requirements are large. The railroads are also taking a large tonnage since the freight movement is increasing. Most of the railroad contracts have been made and many of the steam contracts with manufacturing establishments have been closed.

Some stir is being felt in domestic sizes. While the stocking season has not opened, retailers are placing small orders. Preparations are being made to take care of the stocking demand earlier than usual. Most of the dealers in this section have very light stocks and they are placing their orders now.

Quotations have been well maintained in every mining district and on all grades with the possible exception of fine coal, on which there is a slight weakness. This is due to the larger tonnage of nut, pea and slack and coarse slack resulting from the Lake trade. Mine-run and three-quarter inch are the strongest sizes in the market.

The output in Ohio fields has been fairly large during the week although the car shortage has decreased it in certain localities. In the Pomeroy Bend district where the operators are slowly recovering from the effects of the flood the production is gradually increasing. In Eastern Ohio it is estimated at about 65 per cent. of normal while in the Hocking Valley it is about 85 to 90 per cent.

Quotations in the Ohio fields are as follows:

	Hocking	Pittsburgh	Pomeroy	Kanawha
Domestic lump	$1.50	.....	$1.50	$1.50
¾-inch	1.35	$1.25	1.35	1.30
Nut	1.15	.....	1.25	....
Mine-run	1.15	1.10	1.15	1.10
Nut, pea and slack	0.70	.....	0.70	0.70
Coarse slack	0.60	0.65	0.60	0.60

LOUISVILLE, KY.

A between-seasons lull seems to be prevailing over the local market. This is due probably to the reluctance on the part of the dealers to begin laying in their winter stock.

The local market has undergone a direct reversal of form within the last ten days, particularly in the steam-coal branch. The scanty supply has been abruptly relieved and there are plenty of tonnages available now. With railroad conditions again practically restored to normal, there is a good, strong movement; dealers are stocking quite heavily, and there appears to be plenty of slack coal available.

The Illinois Central R.R. is taking a very heavy tonnage, a great deal more than normal, at any rate, probably for the purpose of accumulating some surplus supplies in case of an emergency. Because of this condition, mines along this line are finding themselves with more slack on hand than they are able to market and as a consequence quotations have fallen off to ridiculously low points.

BIRMINGHAM, ALA.

Considerable alarm is felt among the local operators lest the car shortage, which has gradually grown worse for the past few weeks, will not be remedied before fall. The labor situation is also apparently growing more serious from week to week. The domestic coal market is possessed of a little more interest than during the few weeks preceding, owing principally to the fact that many of the mines have not been furnished with sufficient equipment to keep up with monthly specifications on contracts with dealers.

The market for steam coal is quiet, but quotations have not changed materially during the past three weeks. A good deal of interest is added to the steam market, as this is the season of the year when most annual contracts are being closed for shipments to begin July 1.

Foundry coke maintains a stiffness decidedly above other kindred markets on which it so often depends. Record high prices are now being obtained and the market has been extended over the entire Western States. The demand for furnace and smelter coke is well balanced with the production.

INDIANAPOLIS

The mine situation here is about what it usually is in June and July. While there is fair demand for steam grades, there is nothing doing in domestic. Prices are at the bottom and no prospect for an advance. Some buyers, however, say they note a stiffening in the price of steam grades, probably due to the higher tendency in Eastern coals, which throws more inquiries to Indiana operators. Wholesalers in this city say there is not as much free coal in the market as there was a year ago and they are having continued trouble to place orders for their requirements. The largest consumers of steam grades have placed their orders for next season, and contracts are being made quite liberally with those that take wagon delivery. A slight advance is looked for the first of June in eastern coals. Retailers say deliveries to householders for next winter's consumption, is up to the average for May, if not somewhat above that. The experience of these domestic consumers the past seson was such as to make them more eager to buy earlier than usual.

DETROIT, MICH.

Bituminous—The contract market in this vicinity is showing increased strength, but spot sales are somewhat off. An embargo against lake coal, which was established by two of the large carriers has diverted a great deal of fuel here on consignment, with the result that this had been forced on the market and a reduction in prices has consequently followed; however, the indications are that the slump is only temporary. Buyers are also showing only a slight inclination to purchase believing apparently that a decided slump is in prospect.

The following is approximately the Detroit market:

	W. Va. Splint	Gas	Hocking	Cambridge	No. 8 Ohio	Pocahontas	Jackson Hill
Domestic lump	$1.50	....	$1.40	....	....	$2.00	$1.90
Egg	1.50	....	1.40	....	....	2.00	1.90
1¼-in. lump	1.25	....	....	....	....	....	....
¾-in lump	1.10	$1.10	1.10	$1.10	$1.10	....	....
Mine-run	1.00	1.00	1.00	1.00	1.00	1.25	....
Slack	1.00	0.75	0.75	0.75	0.75	....	....

Anthracite—Buying of hard coal in the local market has been gradually improving, due, of course, to the demand for storage coal. The demand for this purpose customarily starts somewhat earlier than this, but has been delayed this season by the late shipments. The local dealers are reporting a good business for the current month.

Coke—The demand for this commodity is strong and the market firm in every respect, with local ovens working to their maximum capacity and behind on shipments. Connellsville is quoted at $2.80; Semet Solvay, $3; gas house, $2.75, all f.o.b. ovens.

ST. LOUIS, MO.

Conditions are about normal as they have been for the past few weeks, with perhaps a similar demand for bituminous coals. In connection with this, the price has also gone down. Standard 6-in. lump has gone down to 85c. and 87½c. at the mines, while 2-in. lump is at from 80c. to 85c.

These prices not only prevail in the city, but also in the country to some extent, on demurrage coal. In the Carterville sizes the lump and egg are being sacrificed at $1, both in the city and outside, while screenings have not increased any in value. Some of the washed sizes are a drug on the market, and are being sold at the same price as unwashed coals.

The prevailing circular is:

	Carterville and Franklin Co.	Big Muddy	Mt. Olive	Standard
2-in. lump	.....	.....	.....	$0.90
3-in. lump	.....	.....	$1.20	.....
6-in. lump	$1.15 @ 1.20	.....	1.25	1.05
Lump and egg	.....	$2.25	.....	.....
No. 1 nut	1.05 @ 1.15	.....	.....	.....
Screenings	0.90 @ 0.95	.....	.....	0.85
Mine-run	1.00 @ 1.10	.....	.....	0.80
No. 1 washed nut	1.35	.....	.....	.....
No. 2 washed nut	1.20	.....	.....	.....
No. 3 washed nut	1.25	.....	.....	.....
No. 4 washed nut	1.25	.....	.....	.....
No. 5 washed nut	1.00	.....	.....	.....

St. Louis prices on May anthracite are: Chestnut, $7.50; stove and egg $6.80; grate $655. Smokeless lump and egg is $4.45 and mine-run $4. Byproduct coke is $5 and gas house $4.75.

OGDEN, UTAH

There are probably instances where a low price would be an inducement to a large consumer to place an order, and this would offer temporary relief, but the bulk of the coal goes to dealers who at present are only buying single cars, and then only when absolutely necessary. In other words, the mines are working short time, which increases the cost.

Reports indicate that some coal will be stored during June and that July will probably be up to standard; however, this will be caused by the season of the year, and not by the low price. Present quotations for the entire territory are: Lump, $2.25; nut, $1.75; mine-run, $1.75, and slack, $1.

PORTLAND, ORE.

The mines in the Centralia district are all preparing to increase their output for which there is a good demand both in the Puget Sound cities and in Portland. One company is now putting out about 1500 tons daily and another has an output of 500 tons. The Rainer company's mine has an output of about 100 tons daily but this will be increased as rapidly as possible. Development work is now under way.

The coal market here is unchanged and as we now have

summer weather there is little probability of any great volume of business until consumers begin putting in coal for next winter under the storage rates, which are about 50c. per ton lower.

PRODUCTION AND TRANSPORTATION STATISTICS

NORFOLK & WESTERN RY.

The following is a comparative statement of the coal and coke shipments over the lines of the N. & W. Ry. for the month of April and the first four months of 1912 and 1913 in short tons:

Destination	April 1912	April 1913	4 Months 1912	4 Months 1913
Coal				
Tidewater, foreign	223,220	147,917	589,202	535,211
Tidewater, coastwise	315,076	326,920	1,137,359	1,300,671
Domestic	1,325,259	1,068,383	5,395,002	5,401,914
Coke				
Tidewater, foreign	7,744	6,950	25,147	16,984
Domestic	108,601	122,675	509,919	561,469
Total	1,979,900	1,672,845	7,656,629	7,816,249

COAL MOVEMENT

The following is a summary of the fuel movement over the principal roads during March and the first three months of this year and last:

	1913			Three Months	
Anthracite.	January	February	March	1913	1912
B. & O. (a)	195,667	161,676	77,049	434,392	571,754
C. & O. (a)	378	1,480	309	2,167	11,227
Erie	673,614	612,281	672,153	1,958,048	2,179,941
Penna. (a-b)	1,014,259	988,036	741,209	2,743,504	3,288,737
Virginian	89	56	166	311	.....
Total 5 roads	1,884,007	1,763,529	1,490,886	5,138,422	6,051,659
Bituminous:					
B. & O. (a)	3,187,956	2,633,197	2,710,031	8,531,184	8,761,578
B. R. & P. (c)	774,052	752,999	766,576	2,293,627	2,299,829
B. & Susq. (c)	143,814	150,544	155,706	450,064	468,079
C. & O. (a)	1,263,892	1,304,748	1,392,590	3,961,230	4,306,586
Erie	60,373	62,941	61,538	184,852	113,335
H & BTM (a-c)	150,149	129,114	102,337	381,600	402,070
NYC&HRR (c)	886,742	787,078	770,165	2,443,985	2,392,196
N. & W (a-c)	2,069,874	1,873,544	1,751,158	5,694,576	5,258,008
Penna (a-b)	4,210,196	3,857,304	4,050,247	12,117,247	12,169,935
P & L. E. (a-c)	1,033,330	920,183	956,138	2,909,651	2,876,295
P. S. & N. (c)	228,426	224,215	229,341	681,982	563,772
Virginian (c)	453,886	399,267	380,091	1,233,244	903,966
W. M	241,021	248,678	271,286	760,985	722,775
Total 13 roads	14,703,711	13,343,812	13,597,204	41,644,727	41,238,424
Coke:					
B. & O (a)	109,620	371,355	405,220	886,195	1,080,472
B. R. & P. (c)	57,831	50,265	55,911	164,007	113,478
B. & Susq. (c)	28,153	22,209	27,401	77,763	81,971
C. & O. (a)	30,764	29,643	32,207	92,614	59,951
NYC&HRR (c)	7,548	4,106	5,775	17,429	23,248
N. & W. (a-c)	148,251	152,847	147,730	448,828	418,721
Penna. (a-b)	1,288,514	1,220,360	1,247,451	3,756,325	3,111,786
P. & L.E (a-c)	668,392	579,360	612,095	1,859,847	1,488,430
P. S. & N. (c)	3,212	2,996	3,084	9,292	4,817
W. M	6,643	6,014	6,381	19,038	19,283
Total 10 roads	2,348,928	2,439,155	2,543,255	7,331,338	6,402,112

Southern Railway handled during January 358,386 short tons; February 345,206 short tons of bituminous coal.

a. Includes coal received from connecting lines.
b. Does not include company's coal hauled free.
c. Includes company's coal.

THE CAR SITUATION

American Ry. Association reports surpluses and shortages of coal equipment for two weeks ended May 15, as follows:

	Surplus	Shortage	Net*
New England Lines	76	0	**76**
N. Y.; New Jersey, Del.; Maryland; Eastern Penn.	2,640	1,054	**1,586**
Ohio; Indiana; Michigan; Western Pennsylvania	789	934	145
West Virginia, Virginia, North & South Carolina	781	1,500	719
Kentucky, Tenn.; Miss.; Alabama, Georgia, Florida	226	503	277
Iowa, Illinois, Wis., Minn.; North & South Dakota	2,622	10	**2,612**
Montana, Wyoming, Nebraska	367	0	**367**
Kansas, Colorado, Missouri, Arkansas, Oklahoma	2,032	75	**1,957**
Texas, Louisiana, New Mexico	305	6	**299**
Oregon, Idaho, California, Arizona	2,254	138	**2,116**
Canadian Lines	175	58	**117**
Totals	12,267	4,226	**8,041**
Greatest surplus in 1912 (Apr. 25)	94,692	2,144	**92,548**
Greatest shortage in 1912 (Oct. 10)	6,491	14,897	8,406

***Bold face** type indicate a surplus.

NORFOLK & WESTERN RY.

The following is a statement of tonnages shipped over this road from mines in West Virginia and the commercial and company coal, for the month of April, in short tons:

Field	Shipped	Tipple	Total	Commercial	Company
Pocahontas	861,724	13,947	875,671	865,154	95,271
Tug River	183,995	2,498	186,493	156,336	30,157
Thacker	189,004	10,359	199,363	142,167	57,196
Kenova	48,839	5,042	53,881	45,713	8,168
Clinch Valley				130,565	12,493
	1,283,562	31,846	1,315,408	1,339,935	203.285

Shipments of coke entirely from the Pocahontas field, were 96,659.

BALTIMORE & OHIO R.R.

The following is a comparative statement of the coal and coke movement over this road or April and the first four months of this year and last year:

	April 1913	April 1912	4 Months 1913	4 Months 1912
Coal	2,516,367	2,122,285	10,608,227	10,434,855
Coke	400,317	390.228	1,616,070	1,470,655
Total	2,916,684	2,512,513	12,224,297	11,905,510

FOREIGN MARKETS

GREAT BRITAIN

May 16—The market is somewhat unsettled owing to the uncertain position after the holidays. Business is quiet, but there is no alteration in values—which are approximately as follows:

Best Welsh steam	$5.40@5.52	Best Monmouthshires	$4.74@4.86
Best seconds	5.28@5 40	Seconds	4.62@4 74
Seconds	5.04@5.28	Best Cardiff smalls	3.60@3.72
Best dry coals	5.04@5.28	Seconds	3.36@3.48

The prices for Cardiff coals are f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport; both exclusive of wharfage, and for cash in 30 days—less 2½%.

PENNSYLVANIA RAILROAD

The following is a statement of shipments over the P. R.R. Co.'s lines east of Pittsburgh and Erie for April, and first four months of this year and last year in short tons:

	April 1913	April 1912	Four Months 1913	Four Months 1912
Anthracite	930,592	290,865	3,674,096	3,579,602
Bituminous	3,796,432	3,291,985	15,914,179	15,461,920
Coke	1,230,979	1,079,046	4,987,304	4,190,832
	5,958,003	4,661,896	24,575,579	23,232,354

COAL SECURITIES

The following table gives the range of various active coal securities and dividends paid during the week ending May 24:

Stocks	Week's Range High	Week's Range Low	Week's Range Last	Year's Range High	Year's Range Low
American Coal Products	87	87	87	87	87
American Coal Products Pref.	109½	109½	109½	109½	109½
Colorado Fuel & Iron	31½	30¼	31	41½	30¼
Colorado Fuel & Iron Pref.	....	....	155	155	150
Consolidation Coal of Maryland	102¼	102¼	102¼	102¼	102¼
Lehigh Valley Coal Sales	225	210	215	....	...
Island Creek Coal, com	52	51	51	....	....
Island Creek Coal Pref.	85	84	84	....	....
Pittsburgh Coal	17⅜	17⅜	17⅜	24⅜	17¼
Pittsburgh Coal Pref.	82⅜	81	82⅜	95	79¼
Pond Creek	22¼	19¼	19¼	23⅜	19¼
Reading	163	159⅛	162⅜	168⅞	152½
Reading 1st Pref.	91	90	90	92½	89½
Reading 2nd Pref.	89	89	89	95	87¼
Virginia Iron, Coal & Coke	43	43	43	54	43

Bonds	Closing Bid	Closing Asked	Week's Range or Last Sale		Year's Range	
Colo. F. & I. gen s.f.g. 5s	95	97	97	97	95	99½
Colo. F. & I. gen. 6s	..	..	107½	June '12	..	..
Col. Ind. 1st & coll. 5s. gu	79	81	78⅝	79½	78½	85
Cons. Ind. Coal Me. 1st 5s	..	80	85	June '11	..	..
Cons. Coal 1st and ref. 5s	..	94	93	Oct. '12	..	..
Gr. Riv. Coal & C. 1st g 6s	..	100	102⅝	April 06	..	..
K. & H. C. & C. 1st s f g 5s	..	96	98	Jan. '13	98	98
Pocah. Con. Coll 1st s f 5s	86½	87½	87⅛	Mar. '13	87½	87¼
St. L. Rky. Mt. & Pac. 1st 5s	..	78	76	Mar. '13	76	80
Tenn. Coal gen. 5s	100	101⅛	100	May '13	100	103
Birm Div. 1st consol. 6s	101½	103¼	101	April '13	101	103
Tenn. Div 1st g 6s	..	102	102	Feb. 13	102	102
Cah C M. Co. 1st g 6s	..	104	110	Jan. 09	..	..
Utah Fuel 1st g 5s	..	..	..	....	..	..
Victor Fuel 1st s f 5s	..	80	80	May '13	79¾	80
Va. I Coal & Coke 1st g 5s	93	95	93	May '13	93	98

No Important Dividends were announced during the week.